

REVISION OF *IRIDOPAGURUS* (CRUSTACEA: DECAPODA: PAGURIDAE) WITH THE DESCRIPTIONS OF NEW SPECIES FROM AMERICAN WATERS

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ABSTRACT

A systematic review has been made of the genus *Iridopagurus* from the Atlantic and Pacific waters of America. In addition to the redescription of the genus and diagnoses of all known species, three new species are described and illustrated. Several systematic problems have been resolved. A key to the species is given.

The genus *Iridopagurus* was erected by Michele de Saint Laurent-Dehancé in 1966. Prior to that time, species assigned by this carcinologist to *Iridopagurus* had been assigned to *Spiropagurus* Stimpson [sensu stricto] by early carcinologists, Stimpson (1858; 1859), A. Milne-Edwards (1880) and A. Milne-Edwards and Bouvier (1893), who worked with the Atlantic species, and Faxon (1893) who described *S. occidentalis* from the Pacific Ocean. A brief historical review of the existing literature has been presented to show the origin of several major taxonomic problems.

The genus *Spiropagurus* was erected by Stimpson in 1858 for two species, *Pagurus spiriger* De Haan, 1850 from the Indo-West Pacific Region, and *S. dispar* Stimpson, 1858, from the Antillean Caribbean Sea at that time technically a *nomen nudum* because he neglected a formal description until the following year. Stimpson removed the former species from the genus *Pagurus* Fabricius, 1775 and placed it in his newly erected genus *Spiropagurus*, primarily because of the presence of sexual tubes in the males and the dilated corneae of the eyes; consequently, *Spiropagurus* Stimpson, 1858 has as type *Pagurus spiriger* De Haan by original designation and monotypy.

In 1880, A. Milne-Edwards described specimens collected by the S/S BLAKE off the coast of Barbados as *S. iris*; however, actually in his brief description he confounded two distinct species.

A. Milne-Edwards and Bouvier (1893) reexamined the same material collected by the S/S BLAKE and elaborated on the first author's preliminary descriptions. These carcinologists described *S. iris* [sensu lato] and *S. caribbensis*, and described a specimen that they questionably assigned to *S. dispar*. Part of the confusion relating to the latter taxon is because its type material apparently had been destroyed (Rathbun, 1884).

Provenzano (1961) erroneously synonymized *S. caribbensis* with *S. dispar*. Apparently he believed that he had Stimpson's taxon, because of the reticulated pattern of the chelipeds that corresponded with Stimpson's (1859) description of *S. dispar*. Subsequently, Williams (1965), following Provenzano's misinterpretation of *S. dispar*, described and illustrated *S. dispar* [sensu Provenzano] apparently based on specimens of true *S. caribbensis*. However, he quoted the coloration reported by Provenzano (1961) for *S. dispar* which also appears to correspond with that of an undescribed species (see *Iridopagurus reticulatus* n. sp.).

After studying the pagurids collected by the R/V CALYPSO off the Atlantic coasts of South America, De Saint Laurent-Dehancé (1966a) divided *Spiropagurus*

Stimpson into two genera, *Spiropagurus* s.s. and *Iridopagurus*. She characterized the latter genus by the bifid laminar condition of the gills, and the absence of the accessory tooth on the crista dentata of the third maxilliped. She based her generic description on approximately 20 specimens representing six species, four of which originally had been assigned to *Spiropagurus* and two which she described as new species. These were *I. dispar* [(Stimpson, 1859) sensu De Saint Laurent-Dechancé], *I. iris* [(A. Milne-Edwards, 1880) sensu lato], *I. caribbensis* (A. Milne-Edwards and Bouvier, 1893), *I. occidentalis* (Faxon, 1893), *I. violaceus* De Saint Laurent-Dechancé, 1966, and *I. globulus* De Saint Laurent-Dechancé, 1966. Later that same year, De Saint Laurent-Dechancé (1966b) discussed the classification of the family Paguridae and the systematic position of the genus *Iridopagurus*. The next year Saint Laurent (1967) noted that the resemblance of the mouthparts of *Iridopagurus* and *Catapaguroides* represented phyletic characters.

My interest in the present study has been prodded by the discovery of several new species and the realization of a need for the review of the characters described for the genus *Iridopagurus*. Moreover, newly recognized characters as well as the need for consideration of intraspecific variation and interspecific overlap in morphological characters have made the review of this genus significant.

The present extensive collections contain nine species of *Iridopagurus*, three being new to science. These collections were examined with emphasis on intra-specific variation, considering all diagnostic or presumably diagnostic characters, including mouthparts and secondary sexual characters.

MATERIALS AND METHODS

The majority of the specimens used in this study were collected during oceanographic cruises by the research vessels JOHN ELLIOTT PILLSBURY and GERDA of the University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS) supplemented by collections made by the research vessels OREGON II and SILVER BAY from the National Marine Fisheries Service Laboratory, Pascagoula, Mississippi (NFSL), the University of Alabama's Dauphin Island Sea Lab. (DISL), the Academy of Natural Sciences of Philadelphia (ANSP), la Sociedad de Ciencias Naturales de La Salle, Isla de Margarita, Venezuela (SCNLS), The Zoological Museum, København, Denmark (ZMKD), the Allan Hancock Foundation, University of Southern California (AHF), Instituto de Investigaciones Marinas de Punta de Betin, Santa Marta, Colombia (INVEMAR), and some private collections. Type material was borrowed from the Harvard University Museum of Comparative Zoology, Cambridge, Massachusetts (MCZ), and the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); holotypes have been deposited in the above latter institution; paratypic material, when possible, has been accessioned into the Rosenstiel School of Marine and Atmospheric Science Invertebrate Museum (formerly University of Miami Marine Laboratory, UMML), the Rijksmuseum Van Natuurlijke Historie, Leiden, The Netherlands (RMNH), The National Museum of Natural History, the Museum National D'Histoire Naturelle, Paris, France (MNHN), the Bermuda Biological Station for Research, St. George's West, Bermuda (BBSR), and the Dauphin Island Sea Lab Museum.

The specimens were examined using a Wild M-5 binocular microscope. The mouthparts were stained with a heated 3% solution of Chlorazol E in Lactophenol (McLaughlin, 1976); they were then permanently mounted using a polyvinyl alcohol lactophenol, and examined under a Wild compound microscope; the illustrations were made using a Wild M-5 drawing tube. A single measurement, the shield length (SL) was taken for each specimen; measurements were made using an ocular micrometer. The symbols ♂, ♀, ov, and J refer to male, female, ovigerous and juvenile, respectively.

Ten specimens (9 *Iridopagurus caribbensis* and 1 *I. reticulatus* n. sp.) collected via scuba diving in the Atlantic Ocean off the Florida cities of Hollywood and Dania, were kept isolated from each other by screened dividers in a 10-gallon aquarium supplied with circulating water from Biscayne Bay at Bear Cut, and an undergravel filter covered with fine crushed coral sand. Two fluorescent units, regulated by an electric timer, provided the daily light-dark periods; the tank was cleaned daily and the coral sand was replaced once a month; for approximately 10 months the hermit crabs were daily fed with pieces of meat of spiny lobster, shrimp or fish. Molts were observed microscopically, giving a more clear view of the external morphology of these two species; the shield length was measured for each molt, providing preliminary estimates of growth. Coloration in life was observed. Molts and specimens were preserved in 70% ethanol.

MORPHOLOGICAL AND TAXONOMIC CONSIDERATIONS

General information of the morphology of the family Paguridae has been obtained in Jackson's monograph of *Eupagurus*, published in 1913, and in Makarov (1938). In general, the terminology of morphological structures follows that of McLaughlin (1974); the spelling of "pereopod" instead of pereiopod has been adopted following Wolff (1962).

A diagnostic character suggested by Squires (1964) and used by several authors, i.e., the shape of the anterior lobe of the sternite of P_3 , has been found to be of considerable significance in the separation of closely related species, because intraspecific variation in this structure has been found to be comparatively small throughout this study.

During this study other morphological characters, such as the armature of the chelipeds and the setation of the ventral margin of the propodi of P_2 and P_3 , have been found to be of diagnostic significance.

In 1970 De Saint Laurent described in *Solenopagurus* a small sac-like structure covered with fine hairs at the base of the claw on the lateral face of P_4 ; she named this structure a "processus preungual" which appeared to have diagnostic significance. McLaughlin (1974) reported a similar, but hairless, preungual process in several species of the genus *Pagurus*. During this study, two similar structures have been observed in two species of *Iridopagurus*; although they occur on the ventromesial margin of the dactyl between the last scale and the claw, they look like the structure in *Solenopagurus*. The first type appears to be a simple bundle of fine setae that usually reaches the claw distally; this structure is referred to as "preungual process type I" (Fig. 6h). The second structure consists of one, long stiff plumose seta encircled by a bundle of numerous fine short setae; in this case, referred as "preungual process type II" (Fig. 6g); only the stiff plumose setae reach the claw distally.

During the separation of 2 allied species, *I. violaceus* and *I. margaritensis* n. sp., it was found that an inflated sternal setation appears to have both diagnostic and physiological significance.

Organisms Related with Species of *Iridopagurus*

The relationship of hermit crabs to the shells they inhabit has received the attention of several investigators including Reese (1962; 1963a; 1963b), Orians and King (1964), Kellog (1976), and Spight (1977). Although these reports indicate that hermit crabs are found more frequently in certain gastropod shells than in others, it is not known whether shell selection is random, or whether it is based on shell preference.

Very little information on shell selection and commensalism in *Iridopagurus* species has been published. Stimpson (1859) reported that a *Natica* shell inhabited by *Spiropagurus dispar* was encrusted with "hydroid polype." A. Milne-Edwards and Bouvier (1893) reported specimens of *S. iris* in "Natices," "Troque" and an undetermined shell covered with actinians; the former two gastropod shells were also listed by Rabaud (1941) as being occupied by *S. iris*. Other gastropod shells reported as being inhabited by other members of *Iridopagurus* were *Polinices lacteus* and *Murex* sp. (Provenzano, 1961), and *Natica canrena* (Williams, 1965).

Since there is little information in the literature on the gastropod shell preferences of *Iridopagurus*, I have examined the shells available in the preserved collections. Unfortunately, many of the shells already had been removed from the hermit crabs before I had the opportunity to examine them. They apparently make use of a wide variety of gastropod shells, being *Polinices lacteus*, *Nassarius*

albus and *Antillophos candei*, the most frequent species inhabited by members of *Iridopagurus*.

Conclusions concerning the preference for various shells using the specimens in this collection could be misleading, not only because a larger sample is required but also it would be helpful to know how available the gastropod shells were to the hermit crabs in their natural environment.

Another consequence of the small sample of gastropod shells inhabited by *Iridopagurus* has been the lack of information on the occurrence of colonial hydroids, which apparently live commensally with many members of this genus. The first record of this kind of association was that given by Stimpson (1859) when describing *Spiropagurus dispar*. He reported "an incrustation of some hydroid polype around the aperture of the white shell of a *Natica*, inhabited by this small species." The hydroid forms a fringe of polyps (gonozooids and occasionally tentaculozooids) over the outer lip of the gastropod shell which occasionally overgrows the original snail shell, enlarging the living space so that the hermit does not have to seek a larger shelter as it grows. The gastrozooids occur primarily on the inner lip of the shell aperture lying directly under the mouthparts of the hermits; apparently the hydroids benefit from dropped food particles. This hydroid is a new species in the genus *Podocoryne* and it is being described by Ms. Linda Riggs (personal communication).

A brief account of the carcinoecia and occurrence of hydroids and other shell-incrusting organisms, e.g., bryozoans, polychaetes, barnacles and sea anemones, as well as Rhizocephalans, bopyrid isopods and folliculinid protozoans, is reported for each species of *Iridopagurus*.

Iridopagurus de Saint Laurent-Dechancé, 1966

Spiropagurus Stimpson, 1858: 236 (in part). — A. Milne-Edwards and Bouvier, 1893: 110 (in part). — Young, 1900: 372 (in part). — Alcock, 1905: 117 (in part).

Iridopagurus De Saint Laurent-Dechancé, 1966a: 152. Type species by original designation, *Iridopagurus iris* (A. Milne-Edwards, 1880): De Saint Laurent-Dechancé 1966a: 257–265. — Forest and De Saint Laurent-Dechancé, 1967: 161.

Diagnosis.—Eleven pairs of bilobed phyllobranchiate branchiae. Ocular acicles equilaterally triangular, lateral and mesial margins slightly depressed, terminating in acute marginal spine and with additional strong submarginal spine. Ultimate antennular segment with dorsodistal fringe of setae implanted in "V."

First maxilliped with exite well developed. External exopodal margin of second maxilliped with 1 or 2 stiff curved short bristles directed downward, and row of sparse short setae on internal margin. Ischium of third maxilliped with crista dentata with variable number of teeth; no accessory tooth; exopodite with stiff curved short bristles on both margins, all directed upward. Exopods of mxp_2 and mxp_3 are held together during resting position by stiff bristles on lateroexternal margin of mxp_2 , and on laterointernal and lateromesial margins, distally of mxp_3 . Flagella of exopodites of mxp_1 , mxp_2 and mxp_3 , each with moderately long annulated plumose setae.

Chelipeds subequal. Dactyls opening in horizontal plane.

Anterior lobe of sternite of P_3 varies from semisubcircular to subrectangular.

Fourth pereopods simple; dactyl with or without preungual process on ventromesial margin distally; propodal rasp with single row of widely spaced corneous scales.

Males with left sexual tube well developed, coiled, right sexual tube short; 3 biramous unpaired pleopods.

Females with paired gonopores; 4 biramous unpaired pleopods.

Telson apparently without transverse suture; posterior lobes well developed, asymmetrical, separated by deep median cleft; left lobe somewhat larger than right; terminal margins each with few strong spines interspersed with spinules.

Uropods asymmetrical; right uropods less than half length of left uropods. Integument iridescent; iridescence is kept in specimens preserved in ethanol or formalin.

Distribution.—Known only from tropical and subtropical American waters. The depth range is 1–713 m.

KEY TO THE SPECIES OF *IRIDOPAGURUS*

- 1a. Chelipeds smooth *I. dispar* (Stimpson) s.s.
- 1b. Chelipeds spinose 2
- 2a. Distodorsal margin of merus of left cheliped with strong spine *I. iris* (A. Milne-Edwards, 1880)
- 2b. Distodorsal margin of merus of left cheliped glabrous 3
- 3a. Left cheliped with glabrous shallow, moderately broad, longitudinal furrow, extending from proximal dorsal surface of merus to distal dorsomesial surface of palm, flanked by 2 rows of strong acute spines *I. occidentalis*
- 3b. Left cheliped without glabrous, moderately broad, longitudinal furrow, extending from proximal dorsal surface of merus to distal dorsomesial surface of palm, flanked by 2 rows of strong acute spines 4
- 4a. Anterior lobe of sternite of P_3 subrectangular. Fourth pereopods with preungual process 5
- 4b. Anterior lobe of sternite of P_3 not subrectangular. Fourth pereopods without preungual process 6
- 5a. Chelipeds slightly spinose. Fourth pereopods with preungual process type I *I. globulus* De Saint Laurent-Dechancé
- 5b. Chelipeds moderately spinose. Fourth pereopods with preungual process type II *I. haigae* new species
- 6a. Chelipeds with palms ovate, with reticulated color pattern. Anterior lobe of sternite of P_3 roundly rectangular *I. reticulatus* new species
- 6b. Chelipeds with palms subrectangular, without reticulated color pattern. Anterior lobe of sternite of P_3 semisubcircular 7
- 7a. Chelipeds with setae not evenly distributed; densely setose on dorsolateral distal surface of palm and proximal surface of fixed finger. Sternites of P_4 and P_5 with simple setae *I. caribbensis* (A. Milne-Edwards and Bouvier)
- 7b. Chelipeds with setae evenly distributed; not densely setose on dorsolateral distal surface of palm and proximal surface of fixed finger. Sternites of P_4 and P_5 with inflated setae (in males and large females) 8
- 8a. Ambulatory legs with 8 to 12 corneous spines on ventromesial face of dactyls; chelipeds with irregular rows of numerous moderately long acute spines on dorsal surface *I. violaceus* De Saint Laurent-Dechancé
- 8b. Ambulatory legs with 2 to 5 corneous spines on ventromesial face of dactyls; chelipeds with 1 or 2 rows of short spines on middorsal line and dorsomesial and dorsolateral margins *I. margaritensis* new species

Iridopagurus dispar (Stimpson, 1859) [Sensu stricto]

Spiropagurus dispar Stimpson, 1858: 236 (*nomen nudum*); 1859: 88 (type locality: Barbados; 3.7 m).—Alcock, 1905: 188 (in part).—Gordan, 1956: 341 (in part).

Not *Spiropagurus dispar*?: A. Milne-Edwards and Bouvier, 1893: 118, pl. IX: figs. 1–6.

Not *Spiropagurus dispar*: Provenzano, 1961: 165.—Williams, 1965: 133.

Not *Iridopagurus dispar*: De Saint Laurent-Dechancé, 1966a: 162, figs. 21, 25, 30, 35.

Holotype.—Not seen. (Presumably no longer extant.)

Material Examined.—None.

Diagnosis.—"Ophthalmic scales narrow. Chelipeds slender, smooth, glabrous, sparsely ciliated" (Stimpson, 1859: 88).

Description.—"Carapax smooth and glossy, naked. Eyes rather longer than in *S. spiriger* but none over-reaching the tip of the acicle. Ophthalmic scales narrow. Chelipeds slender, smooth, glabrous, sparsely ciliated, unequal in size, the left one being much slenderer, though but little shorter than the right; left hand with slender fingers as long as the palm. Right hand a little longer than the left, and twice as broad and thick; fingers short, not more than half the length of the palm, and coarsely toothed within. Ambulatory feet much longer than the chelipeds and over-reaching their extremities, smooth and hairy; dactyli very slender, not dilated. Feet of the fourth pair almost simple; penult joint with no scabrous surface, but a few corneous marginal denticles. Length about one inch. Colors mostly faded in our specimens; the hands are, however, pale orange, loosely reticulated with threadlike crimson lines, on the white fingers as well as on the palm" (Stimpson, 1859).

Remarks.—Briefly described by Stimpson in 1859, *Spiropagurus dispar* the second species that he assigned to *Spiropagurus*, and the first one reported from the Atlantic was at first (Stimpson, 1858) only cited, and subsequently described very briefly (Stimpson, 1859). As was the case with many of Stimpson's species, the type material of this species apparently was destroyed by a fire in 1871 (Rathbun, 1884). In his description Stimpson stated that the chelipeds were smooth, glabrous, sparsely ciliated; the ambulatory legs were smooth; and the ocular acicles were narrow. He also mentioned the reticulated color pattern on the chelipeds.

In 1893 A. Milne-Edwards and Bouvier described and illustrated a specimen that they questionably assigned to *Spiropagurus dispar*. As Stimpson's type material presumably was destroyed by fire in 1871 (Rathbun, 1884), A. Milne-Edwards and Bouvier could refer only to Stimpson's brief description. They listed several similarities which are generic and not specific, such as relative size of both chelipeds, and between the chelipeds and the ambulatory legs, the simple character of the dactyls of P_4 and not subcheliform. Among the differences they cited were "the narrow ocular acicles" of Stimpson's species versus "the acicles with a wide base and a bifurcated tip" of *S. dispar*? Their specimen had spinose chelipeds and walking legs, while these appendages of Stimpson's species were glabrous. De Saint Laurent-Dechancé (1966a) examined the specimen questionably assigned to *S. dispar* and found that it was not conspecific with Stimpson's taxon and referred to it simply as *Iridopagurus* sp. I had the opportunity to examine not only the specimen assigned to *S. dispar*? by A. Milne-Edwards and Bouvier, but also several specimens, including 17 from Barbados, the same area where Pourtales collected the questionable *S. dispar* in 1871. Although the antennal acicles and chelipeds of this specimen were missing, observing the subrectangular sternite of P_3 with a deep median depression, and following A. Milne-Edwards and Bouvier's description and illustrations of *S. dispar*? particularly the double row of short spines on middorsal surface of the palms, I must conclude that the latter is conspecific with a different taxon (new genus, new species, García-Gómez, in preparation).

Nearly seven decades passed before *S. dispar* [sensu lato] again was reported. Provenzano (1961), Williams (1965) (as *S. dispar*) and De Saint Laurent-Dechancé (1966a) based their identifications of specimens as *I. dispar* on the reticulated pattern of the chelipeds that was described by Stimpson (1859). Subsequent personal examination of much of the material used by these authors has shown that

the ornamentation and setation of these appendages, and the configuration of the ocular acicles does not agree with Stimpson's description, thus I believe these authors did not actually have *S. dispar*, but specimens of *I. caribbensis*, *I. margaritensis* n. sp., *I. reticulatus* n. sp. (Provenzano, 1961), *I. caribbensis* and *I. reticulatus* (Williams, 1965), and *I. reticulatus* (De Saint Laurent-Dechancé, 1966a).

The type material of *S. dispar* has been apparently lost and it would appear that no one since has found specimens which agreed entirely with Stimpson's description. Stimpson's species has been sufficiently well defined to remain distinct, but its generic placement is still questionable. I believe that there is a second species that also has a reticulate color pattern on the chelipeds, that has been confounded with Stimpson's species (see *I. reticulatus*, n. sp.). A thorough search of the Barbados area for additional material would be worthwhile.

Iridopagurus iris (A. Milne-Edwards, 1880)

Spiropagurus iris A. Milne-Edwards, 1880: 44 (in part).—Perrier, 1893.—A. Milne-Edwards and Bouvier, 1893: 112 (in part), pl. VIII: figs. 14–25 (type locality: off Barbados, BLAKE station 290).—Alcock, 1905: 188 (in part).—Gordan, 1956: 341 (in part). See remarks.—Rabaud, 1941: 190, fig. 1 (abdominal muscles).—Hazlett, 1966: 88–89 (Behavior).

Iridopagurus iris: De Saint Laurent-Dechancé, 1966a: 159 (in part). See remarks.

Lectotype (by implication).—♂ (SL = 5.5 mm); MCZ-4022; by subsequent selection by A. Milne-Edwards and Bouvier, 1893: 114.

Paralectotypes (by implication).—4 ♀ (SL in mm = 1.6; 1.8; 2.0; 2.6); MCZ-4007 (in part).

Material Examined.—See Table 1.

Diagnosis.—Chelipeds and ambulatory legs strongly spinose; merus of left chela with strong spine at distodorsal margin; anterior lobe of sternite of P₃ semisubcircular.

Color.—In living specimens, body and appendages white; ocular peduncles white with blue corneae (Provenzano, field notes). All color in alcohol preserved specimens fading to white or straw color.

Related Organisms.—Carcinoecia: *Nassarius albus* (5), *Antillophus candei* (4), *Polinices lacteus* (3), *Natica canrena* (2), *Murex formosus* (2), *Admete* sp. (1), *Arnaea retifera* (1), *Fusinus* sp. (1), *Murex recurvirostris rubidus* (1) and Trochidae (1).

Two of the shells inhabited by *I. iris* (*Polinices lacteus* and *Natica canrena*) had colonial hydroids *Podocoryne* n. sp. attached to the aperture; near the outer lip of the latter shell, there were two serpulid polychaetes.

An undescribed species of the bopyrid *Pseudasymmetrione*, Adkison and Heard (1978) was found within the branchial chamber of *I. iris* (male SL = 1.7 mm; R/V PILLSBURY station 757); except for the typical swelling of the branchiostegite, no other external changes in the host were observed.

Behavior.—Hazlett (1966) in his comparative behavioral study of eleven species of hermit crabs collected in the Straits of Florida (depths = 110–713 m) stated that *Iridopagurus iris* (R/V PILLSBURY station 198: 14 specimens) was the most "pagurid" species observed, differing from the diogenids (*Clibanarius anomalus*, *Paguristes spinipes*, *P. moorei*, *P. "A,"* and *Dardanus insignis*) more than the other species (*Pagurus rotundimanus*, *P. politus*, *Pylopagurus discoidalis*, and *Parapagurus pictus*). He also noted that these specimens did not seem to be walking but rather half swimming, half running around the aquarium.

Distribution.—*Iridopagurus iris* is known in the western Atlantic from the Gulf Stream, off northwest Little Bahama Bank south to North Bahama Islands, Puerto

Rico, Saint Vincent in the Windward Islands, Barbados, Trinidad and Tobago, French Guiana, Venezuela, Colombia, off Southwest Cay in the southwestern Caribbean, and Islas Mujeres, off the Yucatan Peninsula, Mexico.

De Saint Laurent-Dechancé (1966a) attributed to Florida R/V PILLSBURY station 198 (27°45'N, 79°15'W), however, it actually was located approximately 25 miles northwest off Little Bahama Bank. In addition to the type locality, Barbados (A. Milne-Edwards, 1880), a record in the literature included Grenada, in the Windward Islands (A. Milne-Edwards and Bouvier, 1893). These new records of *Iridopagurus iris* from the Gulf Stream, off French Guiana and off Islas Mujeres, extend the range of this species to the north, east, south, and west.

The bathymetric range for specimens in this collection is 64–713 m. The previously recorded range was 135–256 m (De Saint Laurent-Dechancé, 1966a). The present records show that *I. iris* is the deepest of the known species of *Iridopagurus*.

Remarks.—*Spiropagurus iris* was briefly described by A. Milne-Edwards in 1880; a male lectotype was subsequently designated by A. Milne-Edwards and Bouvier (1893). These authors also more completely described and illustrated this species.

In 1966, De Saint Laurent-Dechancé designated this species as the type of her new established genus *Iridopagurus*. She based her redescription of this species on what she believed to be the complete type series, six female paralectotypes (BLAKE station 290: Barbados). In examining that series, I found that two female paralectotypes were not conspecific with the lectotype of *S. iris* from the same locality. A. Milne-Edwards and Bouvier's and De Saint Laurent-Dechancé's descriptions refer to *I. iris*; however, two distinct taxa were confounded in the series of paralectotypes. The two specimens of *I. globulus* herein have been referred to that taxon.

Iridopagurus iris is easily distinguished from other congeneric species by the more spinose armature of the chelipeds and walking legs. The left cheliped with a strong spine on dorsodistal margin of merus immediately separates this species from the other eight. It is also the largest of the species of the genus *Iridopagurus*.

Iridopagurus occidentalis is the analogous Pacific species of *I. iris*.

Iridopagurus caribbensis (A. Milne-Edwards and Bouvier, 1893)

Spiropagurus caribbensis A. Milne-Edwards and Bouvier, 1893: 116, pl. 8, figs. 26 and 30, not figs. 27–29 (type locality: Flannegan Passage, Virgin Islands, BLAKE station 142). See remarks. —Alcock, 1905: 188. —Monod, 1939: 560. —Gordan, 1956: 341.

Spiropagurus dispar: Provenzano, 1961: 165 (in part). —Williams, 1965: 133 (in part), fig. 108. (Not

Spiropagurus dispar Stimpson, 1859). See remarks.

Iridopagurus caribbensis: De Saint Laurent-Dechancé, 1966a: figs. 14, 27, 32, 37.

Holotype. —♂ (SL = 2.5 mm); MCZ-4033.

Material Examined. —See Table 2.

Diagnosis. —Cheliped with setae not evenly distributed, but densely setose on dorsal surface of palm distolaterally and on fixed finger proximally; anterior lobe of sternite of P₃ semisubcircular.

Color. —In living specimens ocular peduncles orange brown distally with a red orange circular band proximally. Shield with 2 pairs of small brown spots, and patches of mottled reddish color posteriorly and laterally. Chelipeds white except for a red brown narrow band on dorsal surface of dactyl and fixed finger distally; also a red brown band on dactyl outlining its margin with palm and continuing at same level across fixed finger proximally; dense patch of orange setae on distal half of right dorsal surface of palm, and a dorsodistal irregular iridescent patch. Walking legs with dactyls each with a red orange circular band near tip; dorsodistal

Table 1. Material examined of *Iridopagurus iris* (A. Milne-Edwards)

Locality		Depth (m)	Station	Date	Sex			SL (mm)	Collector
			Deposition		♂	♀	ov		
Florida East Coast									
27°55.0'N	79°05.0'W	183	SB-3466 UMML-32:4686	25-10-61	2			4.1, 4.5	USFWS
Florida Keys									
25°57.0'N	80°14.0'W	256-274	G-1301 —	27-03-71	6		3	1.5-2.9	RSMAS
Bahama Islands									
27°45.0'N	79°15.0'W	229-256	P-198 UMML-32:4680	11-08-64	10	2		2.6-5.0	RSMAS
27°45.0'N	79°15.0'W	311-329	P-199 —	11-08-64		1		3.8	RSMAS
27°23.0'N	78°35.0'W	201	SB-3469 —	25-10-61	1			3.8	USFWS
26°17.0'N	78°41.0'W	512-713	G-524 UMML-32:4473	03-03-65	2			4.4, 4.5	RSMAS
26°01.0'N	79°10.0'W	143-210	G-725 UMML-32:4688	03-08-65	1			2.5	RSMAS
25°52.0'N	77°54.0'W	227	G-683 UMML-32:4683	20-07-65		1		2.6	RSMAS
Puerto Rico									
18°05.0'N	65°21.0'W	219	O-2627 UMML-32:4685	29-09-59	1			5.2	USFWS
Lesser Antilles									
13°11.2'N	61°05.3'W	156-201	P-874 —	06-07-69	1			3.5	RSMAS
Venezuela									
10°20.0'N	65°02.0'W	64	P-727 —	21-07-68	1	1		2.0, 2.7	RSMAS
10°22.5'N	65°23.0'W	86	P-728 —	21-07-68	1			2.1	RSMAS
10°57.0'N	65°52.0'W	69-155	P-736 —	22-07-68	2			3.4, 4.6	RSMAS
10°54.7'N	66°17.8'W	234-280	P-739 —	23-07-68	1			3.9	RSMAS
10°42.5'N	66°21.0'W	137-192	P-738 —	22-07-68	1			1.8	RSMAS
11°39.6'N	69°22.1'W	161-187	P-757 —	27-07-68	3	1	1	1.7-3.3	RSMAS
Colombia									
12°46.0'N	70°41.0'W	201	O-4398 —	26-09-63		1		2.1	USFWS
12°05.0'N	72°38.5'W	79-82	P-775 —	29-07-68	2		1	1.4-1.9	RSMAS
11°16.9'N	74°17.0'W	165-176	P-785 —	31-07-68			1	2.6	RSMAS
Caribbean									
14°15.5'N	80°27.1'W	219-238	O-4832 —	12-05-64	2			3.8, 3.9	USFWS
Mexico									
21°10.0'N	86°21.0'W	241-320	G-893 UMML-32	10-09-67	1			3.6	RSMAS
Barbados									
—		134	BLAKE-290 MCZ-4022	1878-79	1			5.5	A. Agassiz

Table 1. Continued

Locality	Depth (m)	Station Deposition	Date	Sex			SL (mm)	Collector
				♂	♀	ov		
—	134	BLAKE-290 MCZ-4007	1878-79		4		1.6-2.6	A. Agassiz
—	150	BLAKE-293 MCZ-2626	1878-79		1		2.9	A. Agassiz
—	150	BLAKE-293 MCZ-2654	1878-79		1		3.3	A. Agassiz
—	—	NR:4-2	1969?	2	1		1.7-2.1	—
13°03'50"N 59°37'05"W	172	BLAKE-276 MCZ-4099	05-03-1879		1		3.8	A. Agassiz
13°14'23"N 59°39'10"W	150	BLAKE-293 MCZ-2626	09-03-1879		1		2.7	A. Agassiz
13°14'23"N 59°39'10"W	150	BLAKE-293 MCZ-2654	09-03-1879		1		3.3	A. Agassiz
13°05'00"N 59°39'40"W	256	BLAKE-299 MCZ-2669	10-03-1879	1			2.9	A. Agassiz
Off Sandy Bay	183	HASSLER MCZ-4114	-12-1871	1			3.0	C. Pourtales
Grenada								
11°25'00"N 62°04'15"W	168	BLAKE-258 MCZ-4014	27-02-1879	1			2.1	A. Agassiz
11°25'00"N 62°04'15"W	168	BLAKE-253 MCZ-4020	27-02-1879		2		3.1, 4.0	A. Agassiz
Trinidad-Tobago								
11°22.0'N 61°26.4'W	146	P-848	02-07-69	1	1		2.5, 4.7	RSMAS
11°14.5'N 61°46.2'W	137-143	P-849	02-07-69		1		3.9	RSMAS
11°10.6'N 60°31.2'W	68-73	P-842	01-07-69	1			1.4	RSMAS
French Guiana								
06°07.0'N 52°19.0'W	84-91	P-650	08-07-68	10	5		1.4-3.6	RSMAS

margin of propodi each with a red orange or brown orange band. Specimens preserved in formalin retain their distinct color patterns for a long period of time, but in 70% ethanol, all colors fade in time to white or straw color.

Related Organisms.—Carcinoecia: *Polinices lacteus* (14), *Murex recurvirostris rubidus* (4), *Antillophos candei* (2), *Modulus modiolus* (2), *Coralliophila abbreviata* (1), *Nassarius albus* (1), *Pyrgospira ostrearum* (1), and *Turritella* sp. (1).

Sixteen of the present collections of gastropod shells inhabited by *I. caribbensis* had colonial hydroids *Podocoryne* n. sp. attached to the aperture. The shell of *Pyrgospira ostrearum* was partially covered by young oysters *Crassostrea virginica* (Gmelin, 1791), barnacles *Balanus venustus* Darwin 1854, and *B. eburneus* Gould, 1841, encrusted colonial bryozoans, and serpulid polychaetes. Another shell was so covered by *Balanus venustus* and colonial bryozoans that made its identification impossible; besides, the outline of its aperture was occupied by hydroids *Podocoryne* n. sp.

On 18 specimens out of 74 *I. caribbensis* collected off the Gulf coast of Florida and Alabama, there were folliculinid protozoans (Reinhard, 1942), ranging in

Table 2. Material examined of *Iridopagurus caribbensis* (A. Milne-Edwards and Bouvier)

Locality	Depth (m)	Station		Date	Sex			SL (mm)	Collector
		Deposition			♂	♀	ov		
Florida East Coast									
Off Dania	18-20	— —		07-05-76		2		2.8, 3.5	R. Guest
Off Dania	15-18	— —		04-10-76	3	1		2.7-3.8	R. Guest
Off Dania	18	— —		25-07-77	2	5		1.7-2.8	R. Guest
Off Hollywood	8-9	— —		08-07-75	1			2.4	R. Guest
Off Hollywood	18	— —		04-01-76	1			3.2	R. Guest
Off Hollywood	14	— —		07-02-76	1	2		3.0-3.4	R. Guest
Florida West Coast									
~26°19'N 82°56'W	40	D+M-1:2103 DISL-2103191870822		22-08-77	1		2	2.2-2.5	DISL
~26°26'30"N 83°01'W	37	BLM-22:I DISL-22-58-I-A-2-4		1975-1976		1		3.3	DISL
~27°33'N 83°56'W	49	D+M-1:2748 DISL-2748191870823		23-08-77	1			2.2	DISL
~27°49'N 83°38'W	36	D+M-2:2209 DISL-2209181871027		27-10-77	3	1	1	1.8-2.3	DISL
28°21'N 84°24'W	—	MAFLAII-M-DC-40-45 DISL-2-0114		1974		1		2.0	DISL
28°24'N 84°21'W	—	MAFLAII-N-DC-40-49 DISL-2-0119		1974	1			4.0	DISL
28°28'15"N 84°20'30"W	—	BLM-44:0005330701-1 DISL-0005181860713		03-07-76			1	2.3	DISL
28°28'15"N 84°20'30"W	29	D+M-1:2315 DISL-2315191870830		30-08-77		1		2.2	DISL
28°28'15"N 84°20'30"W	44	D+M-2:0005 DISL-0005181871029		29-10-77	2			2.1, 2.3	DISL
28°28'15"N 84°20'30"W	42	D+M-4:2315 DISL-0005181880205		05-02-78		1		2.7	DISL
28°38'06"N 84°19'06"W	—	MAFLAII-DDC-40-246 DISL-2-0117		1974	1			2.2	DISL
28°42'N 84°20'W	—	MAFLAII-BDC-40-46 DISL-2-0116		1974	1		2	1.9-2.2	DISL
29°04'N 85°14'W	37	BLM-58 33-58-IV-A-9-10 DISL-2-0145		1975-1976		1		2.3	DISL
29°04'N 85°14'W	37	BLM-58 22-58-VI-A-a-10 DISL-2-0150		1975-1976	1			3.2	DISL
29°04'N 85°14'W	37	BLM-58 15-58-IV-A-a-2 DISL-2-0151		1975-1976			1	1.8	DISL
29°04'30"N 85°14'00"W	—	BLM-44:0006 341001-1 DISL-0006181860712		12-08-76	7	1	4	1.7-2.8	DISL
29°48'N 86°03'30"W	—	MAFLAIII-DDC-40-37 DISL-		1974	2			2.6, 3.2	DISL
29°51'N 86°06'30"W	—	MAFLAIII-CDC-40-35 DISL-2-0118		1974	2	1		2.3-2.9	DISL

Table 2. Continued

Locality		Depth (m)	Station	Date	Sex			SL (mm)	Collector
			Deposition		♂	♀	ov		
29°56'N	86°06'05"W	37	BLM-58 30-58-V-A-a-1 DISL-2-0146	1975-1976	1	1		2.1-2.5	DISL
29°56'N	86°06'30"W	—	MAFLAIII-ACD-40-34 DISL-2-0113	1974	1			2.2	DISL
29°56'N	86°06'30"W	—	MAFLAIII-G DC-40-134 DISL-2-0115	1974	1	1		2.5	DISL
~29°58'N	86°09'W	37	D+M-1:2529 DISL-2529181870906	09-06-77	1	1	2	1.6-2.8	DISL
~29°58'N	86°09'W	37	D+M-1:2529 DISL-2529191870906	09-06-77	6		2	1.8-2.6	DISL
~29°58'N	86°09'W	—	BLM-40-VOA-a DISL-2529181860628	28-06-77	7	1	3	1.5-3.4	DISL
~29°58'N	86°09'W	39	D+M-2:2529 DISL-2529181871031	31-10-77	4		3	1.9-2.5	DISL
~29°58'N	86°09'W	39	D+M-2:2529 DISL-2529191871031	31-10-77	5	1	3	1.7-2.7	DISL
Station in Gulf?		—	MAFLA-Unknown A DISL-	1974	1		1	1.8, 2.8	DISL
Alabama									
29°50'N	87°45'W	37	D+M-1:2641 DISL-2641191870908	09-08-77	6		2	1.2-3.0	DISL
Bahama Islands									
3 miles off South Bight, Andros Island		—	— —	08-09-73		1		3.2	C. G. Messing
Lesser Antilles									
Flannegan Passage, Virgin Islands		49	BLAKE-142 MCZ-4033	1878-79	1			2.5	A. Agassiz
Great Salt Pond Bay, St. John, U.S. Virgin Islands		—	— UMML32:1903	29-04-59		1		3.8	J. Randall
Great Salt Pond Bay, St. John, U.S. Virgin Islands		11	— UMML32:1903	-09-59		1		2.7	A. Chess
17°10.0'N	62°38.5'W	27	P-959 —	19-07-69	1			3.0	RSMAS
14°53.8'N	61°04.9'W	46-48	P-913 —	10-07-69	9	1	4	1.9-3.6	RSMAS
Venezuela									
11°06.5'N	64°22.5'W	26-27	P-721 —	21-07-68	1	2	2	2.0-3.6	RSMAS
11°22.5'N	64°08.6'W	—	P-718 —	20-07-68	1			3.1	RSMAS
Off Isla de Margarita, between Punta de Piedras and Isla Cubagua		—	— —	12-05-61		1		3.3	SCNLS
10°36.1'N	68°12.2'W	22-27	P-750 —	25-07-68	1			3.7	RSMAS
Curaçao									
Off Carmabi		15-23	— Dept. of Mar. Sci. Univ. de Puerto Rico	09-01-79	4		2	1.9-2.5	L. Meiklejohn
Colombia									
Off Santa Marta		—	25 —	—	1	1		2.9, 3.4	—

number from 1 to 14 specimens per host; this is the first recorded folliculinid in the genus *Iridopagurus*, and probably not only the first recorded host not in the genus *Pagurus* but also a new record for their occurrence in subtropical waters.

A female (SL = 2.1 mm) collected in the Gulf of Mexico (Station BLM-58:13-58. V.A. a.5) had a rhizocephalan attached to the left side of the abdomen, between the first and second pleopods; no external modification caused by this parasite were observed; this is the first recorded rhizocephalan infesting the genus *Iridopagurus*.

A male (SL = 2.2 mm) taken off Sanibel Island, Florida (Station 2103: 40 m) was infested by the bopyrid isopod *Stegophryxus hyptius*: 1 non-gravid female attached to the left side of the host abdomen, 1 male on the host exopodal flagellum of the right mxp₃, and 1 cryptoniscium larva from the brood chamber; no changes in the external morphology of the host were noted. This finding represents the first recorded bopyrid in *Iridopagurus caribbensis*.

Behavior.—Live tank observation of specimens of *I. caribbensis* (5 males, 4 ovigerous females) taken off the east coast of Florida near Hollywood and Dania, provided some information on growth and general behavior of this species. The increase range in shield length per molt was 0.2 to 1.3 mm. They survived for approximately 10 months with the exception of 2 deaths caused by the attack of a very aggressive female. This specimen was extremely active, often jumping distances up to 10 cm, hitting the tank's walls with her shell. This wild hermit climbed the screened divider and jumped down into the next compartment tracing an arch path; as soon as she reached the bottom, she started chasing the other compartment's occupant, a female, finally forcing the latter out of her shell. This less aggressive female lost one cheliped during the fight and the next day was found dead. Three months later, the same belligerent female also chased and killed a male specimen.

One male specimen stayed out of his shell for approximately 2 weeks, always holding its aperture even during feeding; he stopped feeding a few days before molt. During molting there is always some danger, and mortality is often high at this time. Apparently this specimen encountered difficulties during his molt because the dead soft body and its molt were found in the tank.

Distribution.—*Iridopagurus caribbensis* has been collected along the Alabama coast, in the Gulf of Mexico, both coasts of Florida, off Andros Island in the Bahama Islands, through the Lesser Antilles, as far south as Martinique, and along the Caribbean coasts of Venezuela and Colombia. The type locality and two other locations, one reported by Monod (1939) off Guadeloupe, in the Lesser Antilles, and another by De Saint Laurent-Dechancé (1966a), off the east coast of Florida, are the only records so far published. Most of the locations presented herein are new records for this species.

The depth range for the present material collected is 8–49 m; besides the depth of 49 m for the type locality, reported ranges were 15–20 m (Monod, 1939) and 15–50 m (De Saint Laurent-Dechancé, 1966a).

Remarks.—In examining the holotype of *S. caribbensis*, I found a discrepancy between this specimen and parts of A. Milne-Edwards and Bouvier's description, such as the lack of the meral spine of MXP₃ and the glabrous condition of the left cheliped. I also found a discrepancy between the holotype and figures 27–29 (Plate 8). Provenzano (1961) included *S. caribbensis* in his synonymy of *S. dispar* (sensu lato). At the same time he described the color pattern of living specimens, basing his identification of the species as *S. dispar* on the reticulated color pattern of the chelipeds described by Stimpson. Williams (1965) followed Provenzano in

Table 3. Material examined of *Iridopagurus occidentalis* (Faxon)

Locality	Depth (m)	Station	Date	Sex			SL (mm)	Collector
		Deposition		♂	♀	ov		
Mexico								
Arena Bank, Gulf of California	64–110	ZACA-136 AMNH-12557	-04-36	2			2.2–3.4	W. Beebe
Costa Rica								
5°32'45"N 86°54'30"W	121	ALBATROSS-3368 USNM-21665	28-02-1891	1			3.7	
Colombia								
3°59'40"N 81°35'0"W	95	ALBATROSS-3379 MCZ-4519	01-03-1891	1			4.0	
Ecuador								
Tagus Cove, Albemarle Isl., Galapagos Islands	22	327-35 AHF	10-12-34	6	5	3	1.5–2.4	

considering *S. caribbensis* a synonym of *S. dispar*, and while describing and figuring a specimen of *S. caribbensis* sensu stricto, he quoted Provenzano on the coloration of *S. dispar* sensu lato. M. de Saint Laurent-Dechancé (1966a) correctly removed *I. caribbensis* from *I. dispar* (sensu Provenzano) but apparently did not notice the discrepancy between Stimpson's (1859) description and the specimens from the western Atlantic being referred to *I. dispar*. She also did not notice the discrepancy between the holotype of *S. caribbensis* and some portions of A. Milne-Edwards and Bouvier's description and figures. In view of the basic lack of variation in cheliped armature among species of this genus, I have concluded that Provenzano (1961) and Williams (1965) did not have specimens of *S. dispar* sensu stricto in their collections, but rather *I. caribbensis* and *I. reticulatus* n. sp. Moreover, De Saint Laurent-Dechancé (1966a) did not observe specimens of *I. dispar* s.s. but rather *I. reticulatus* n. sp. (also see remarks under *I. reticulatus* n. sp.). The BLAKE station 142 was erroneously recorded on the holotype's label as 152 and by De Saint Laurent-Dechancé (1966).

Iridopagurus occidentalis (Faxon, 1893)

Spiropagurus occidentalis Faxon, 1893: 172, 173 (type locality: off Isla de Malpelo, Colombia, herein restricted by lectotype selection; ALBATROSS station 3379: 3°59'40", 81°35'0"; 95 m); 1895: 59, 60, pl. XIV: figs. 1–1d.—Alcock, 1905: 188.—Glassell, 1937: 263 (in part) (see *Iridopagurus haigae* n. sp.).—Gordan, 1956: 341.

Iridopagurus occidentalis: De Saint Laurent-Dechancé, 1966a: 171–173.

Lectotype, Herein Selected.—♂ (SL = 4.0 mm); MCZ-4519. See remarks.

Material Examined.—See Table 3.

Diagnosis.—Left cheliped with glabrous, moderately broad, longitudinal furrow, extending from proximal dorsal surface of merus to distal dorsomesial surface of palm flanked by 2 rows of strong acute spines. Anterior lobe of sternite of P₃ semisubcircular.

Color.—Glassell (1937: 263) described the color of 4 specimens preserved in alcohol. "Nearly all trace of color has disappeared in solution from the carapace and chelipeds, except for small purple marking 5 along the markings of the hands and purple bands near the fingers; also there is purple on the spines of the carpus. The ambulatory legs appear to have been banded purple and white."

Living specimens have not been observed; however, in ethanol preserved spec-

imens, coloration patterns are kept for some time; dactyls and fixed fingers, and dactyls of P_2 and P_3 white distally; dorsodistal margin of palm adjoining dactyl red orange, delimiting its boundaries from dactyl, in similar way as in *Iridopagurus margaritensis* n. sp.

Related Organisms.—Carcinoecium: Faxon (1894: 60) reported *Phos* as the gastropod shells inhabited by both syntypes of *I. occidentalis*. While observing the syntypes I was able to identify the gastropods more specifically as *Phos (Metaphos) articulatus* Hinds, 1844.

Faxon (1893: 172; 1895: 59, pl. XIV: fig. 1) reported and illustrated the branchial regions as being swollen. He apparently overlooked the presence of a bopyrid isopod attached to the left side of the host [male (SL = 3.7 mm), collected off Cocos Island (Station ALBATROSS 3368: 121 m)], abdomen causing the swelling of the branchiostegite. This is the first recorded bopyrid in *I. occidentalis*.

A female (SL = 2.4 mm) taken off Albemarle Island (Station AHF 327-35: 22 m) had a rhizocephalan attached to the left side of the abdomen reaching pl_3 ; no external changes of the host were observed; this is the first recorded rhizocephalan infesting *I. occidentalis*.

Distribution.—*Iridopagurus occidentalis* was previously recorded from the Gulf of California (Glassell, 1937) to the Bay of Panama (Faxon, 1893; 1895); the present collection taken off the Galápagos Islands, extends its range southward and west.

The previously recorded bathymetric ranges were 95–121 m (Faxon, 1893; 1895) and 64–110 m (Glassell, 1937); the present record of 22 m shows that *I. occidentalis* also occurs in shallower waters.

Remarks.—Glassell (1937) in his study of the hermit crabs from the Gulf of California and the west coast of Lower California confounded two different taxa in *Spiropagurus occidentalis*. One of the specimens collected by Beebe is not conspecific with Faxon's taxon, and therefore it is assigned to a new taxon, i.e., *Iridopagurus haigae* n. sp.

I. occidentalis is the analogous Pacific species of *I. iris*, sharing the heavily spinose chelipeds and the semisubcircular configuration of the anterior lobe of the sternite of P_3 . The left cheliped, with a dorsal glabrous longitudinal furrow and the lack of a strong meral spine at distodorsal margin, besides the much shorter dorsodistal spine of MXP_3 , easily distinguish *I. occidentalis* from *I. iris*.

Iridopagurus violaceus De Saint Laurent-Dechancé, 1966

Iridopagurus violaceus De Saint Laurent-Dechancé, 1966a: 165, figs. 16, 22, 26, 31, 36 (type locality: off Fernando de Noronha, Brazil, CALYPSO station 19).—Forest and De Saint Laurent, 1967: 162, figs. 147–150.—Markham and McDermott, 1980: 1271.

Holotype.—ov (SL = 6.0 mm); MNHN; not seen.

Material Examined.—See Table 4.

Diagnosis.—Chelipeds with irregular rows of numerous moderately long acute spines; ambulatory legs with 8–12 corneous spines on ventromesial faces of dactyls; sternites of P_4 and P_5 with inflated setae (in males and large females); anterior lobe of sternite of P_3 semisubcircular.

Color.—Living specimens with brown corneae. Ocular peduncles with prominent ring proximally. Antennular peduncles clear but with 2 bands of brown and intense white distally; antennular flagella translucent with yellow tinge dorsally. Antennal peduncle with brown band near base of antennal acicle. Chelipeds with brown

bands across dactyl, and fixed finger, proximally; palm, carpus and merus with scattered brown spots. Ambulatory legs with scattered whitish and brownish areas (Provenzano, field notes). The violet color of *I. violaceus* reported by De Saint Laurent-Dechancé (1966a) corresponds with the brown coloration observed by Provenzano (field note); the cause of this difference is that the former specimens were preserved in alcohol for a period of 3 months, while Provenzano observed living hermits. In 70% ethanol all colors fade to white or straw color.

Related Organisms.—Carcinoecia: *Antillophos candei* (8), *Polinices lacteus* (6), *Murex recurvirostris rubidus* (2), *Nassarius albus* (2), *Natica canrena* (2), *Bulla* sp. (1), *Bursa thomas* (1), *Cymatium* sp. (1), *Modulus modulus* (1), *Murex* sp. (1), *Phalium granulatum* (1), *Stigmaulax sulcatus* (1) and *Turritella exoleta* (1). Hydroids *Podocoryne* n. sp. were attached around the aperture of the following gastropod shells inhabited by *I. violaceus*: 5 *Polinices lacteus*, 2 *Murex recurvirostris rubidus*, 1 *Antillophos candei*, 1 *Cymatium* sp., and 1 *Modulus modulus*.

A male *I. violaceus* (SL = 3.9 mm) collected off Isla La Tortuga, Venezuela (PILLSBURY station 736: 69–155 m) had 3 rhizocephalans attached on left side of the abdomen. This parasitic infestation changed two presumed secondary sexual characteristics of the host, i.e., the normal pleopod number from 3 to 4, and the setation on the sternites of P₄ and P₅ was altered from inflated to simple.

Distribution.—Only a few specimens of *I. violaceus* were collected off the west coast of Florida, the Florida Keys, Little Bahama Bank and off Castle Roads, south coast of Bermuda. The major portion of the present collection was obtained through the Antillean Arc, from Antigua to the Grenadines, off the north coast of Venezuela, Colombia and Panama, and from off the coast of Tobago southeast to French Guiana. This species was previously known only from the type locality, and from the northern coast of Brazil southward to south of Salvador (Bahia), the southernmost locality of all Atlantic species of *Iridopagurus* known (De Saint Laurent-Dechancé, 1966a). Locations for the present collections are new records of *I. violaceus*.

The depth range for material in this collection is 18–256 m, which includes the previously recorded range of 31–39 m (De Saint Laurent-Dechancé, 1966a). Most of the specimens were collected in a bathymetric range of 55–101 m.

Remarks.—*Iridopagurus violaceus* resemble *I. iris* and *I. margaritensis* n. sp. in the similar semisubcircular configuration of the anterior lobe of the sternite of P₃. Its heavily spinose chelipeds are similar to those of *I. iris*, but the absence of a strong spine at distodorsal margin of left cheliped immediately separates *I. violaceus* from *I. iris*. The sternites of P₄ and P₅ of *I. violaceus*, with inflated setae in both males and large females, appear to be identical to those of *I. margaritensis* n. sp.; the more heavily spinose dactyls of the walking legs, and the much shorter setae on ventromesal margin of propodus easily distinguish the former from *I. margaritensis* n. sp.

Iridopagurus globulus De Saint Laurent-Dechancé, 1966

Figure 6h

Spiropagurus iris A. Milne-Edwards, 1880: 40 (in part).—A. Milne-Edwards and Bouvier, 1893: 112 (in part) not pl. VIII, figs. 14–25. See remarks and also *I. iris*.

Iridopagurus globulus De Saint Laurent-Dechancé, 1966a: 169, figs. 28, 33, 38. (Type locality: Northwest Providence Channel, Bahama Islands, GERDA Station 522).

Holotype.—♂ (SL = 2.7 mm); USNM-154571.

Material Examined.—See Table 5.

Table 4. Material examined of *Iridopagurus violaceus* De Saint Laurent-Dechancé

Locality	Depth (m)	Station		Date	Sex			SL (mm)	Collector
		Deposition			♂	♀	ov		
Bermuda									
2 miles off Castle Roads South shore	90		North Star Expedition	30-10-76			1	3.2	J. R. H. Light- bourn & J. C. M. Markham
Florida Keys									
25°19.3'N 80°09.2'W	69-73		UNDAUNTED 6706-5 TABL-67-317	11-12-67	1			5.1	USFWS
Florida West Coast									
27°18'N 84°10'W	—		BLM-46:2747 DISL- 2747191860717	17-07-76		1		2.3	DISL
Bahama Islands									
27°45'N 79°15'W	229-256		P-198 —	11-08-64	1			3.6	RSMAS
Lesser Antilles									
17°08.3'N 62°03.6'W	18		P-966 —	20-07-69		1		2.0	RSMAS
17°06.5'N 62°39.0'W	91-110		O-5070 —	30-09-64			1	4.7	USFWS
14°04.0'N 61°02.0'W	79		O-5062 —	29-09-64	1			4.1	USFWS
12°36.5'N 61°27.5'W	37-40		O-5047 UMML 32:4848	27-09-64	2			2.2, 2.9	USFWS
Venezuela									
10°45.0'N 62°00.0'W	42-47		P-705 —	18-07-68			1	2.4	RSMAS
11°21.0'N 62°21.0'W	79		P-707 —	19-07-68		2		3.1, 3.3	RSMAS
11°22.5'N 64°08.6'W	—		P-718 —	20-07-68	1			3.6	RSMAS
	37		— —	06-10-63	1			2.6	—
Isla de Margarita									
11°01.8'N 65°34.2'W	60-68		P-734 —	22-07-68	3			2.1-3.2	RSMAS
10°20.0'N 65°02.0'W	64		P-727 —	21-07-68	1			2.3	RSMAS
10°57.0'N 65°52.0'W	69-155		P-736 —	22-07-68	2			3.7, 3.9	RSMAS
10°44.0'N 66°07.0'W	60-73		P-737 —	22-07-68	3		2	2.3-3.3	RSMAS
10°50.0'N 66°55.0'W	97		O-4461 —	13-09-63	1	1		2.5, 2.9	USFWS
10°37.0'N 67°57.9'W	59		P-749 —	25-07-68	1		1	2.6, 2.7	RSMAS
Colombia									
12°33.0'N 71°09.0'W	73		O-4391 UMML-32:4849	25-09-63	1			4.0	USFWS
Santa Marta									
	30		24 —	1976	3		3	1.2-1.4	H. Sánchez Moreno
10°40.0'N 75°31.0'W	27-29		P-793 —	01-08-68	1			3.9	RSMAS
9°45.1'N 76°09.1'W	75-79		P-392 UMML-32:4842	16-07-66	2	1		2.6-3.5	RSMAS
9°45.0'N 76°12.0'W	82-101		P-372 UMML-32:4841	13-07-66		2	2	2.8-4.2	RSMAS

Table 4. Continued

Locality	Depth (m)	Station		Date	Sex			SL (mm)	Collector
		Deposition			♂	♀	ov		
9°31.3'N 76°15.4'W	57–59	P-365	UMML-32:4840	13-07-66	4	1	3	2.0–3.9	RSMAS
9°18.2'N 76°24.8'W	68–69	P-396	UMML-32:4843	17-07-66			1	2.7	RSMAS
8°48.7'N 77°12.7'W	97–99	P-403	UMML-32:4844	17-07-66	1	1		2.5, 3.0	RSMAS
Panama									
9°37.5'N 78°54.0'W	64–128	P-330	UMML-32:4839	08-07-66	1			3.2	RSMAS
9°14.6'N 80°21.8'W	48–49	P-434	UMML-32:4846	20-07-66		1		3.1	RSMAS
9°00.1'N 80°45.8'W	59	P-437	—	20-07-66	1			3.3	RSMAS
Barbados									
—		NR-8-2	—	1969	1			2.3	—
—		NR-21-1	—	1969	2	1		1.9–2.4	Lewis
Trinidad-Tobago									
11°10.6'N 60°31.2'W	68–73	P-845	—	01-07-69	1	2		3.0–4.3	RSMAS
Guyana									
07°42.0'N 57°32.0'W	57	P-688	—	15-07-68	1	2		1.9–3.0	RSMAS
07°19.0'N 56°51.0'W	55–59	P-684	—	14-07-68	1		1	2.7, 4.0	RSMAS
Surinam									
06°12.0'N 55°25.0'W	—	P-668	—	10-07-68	1			2.1	RSMAS
French Guiana									
06°07.0'N 52°19.0'W	84–91	P-650	—	08-07-68	4	1	2	2.0–3.5	RSMAS

Diagnosis.—Chelipeds slightly spinose; fourth pereopods with type I preungual process; anterior lobe of sternite of P₃ subrectangular; merus of MXP₃ with very short spine on dorsodistal margin or occasionally unarmed.

Color.—Overall color of living specimens white with diffuse pink, i.e., on anterior two-thirds of shield, ventral surfaces of legs proximally, branchiostegites and mesial faces of carpi; ocular peduncles with a well marked spot on ventroproximal face medially (Provenzano, field notes). All color in alcohol preserved specimens fading to white or straw color.

Related Organisms.—Carcinoecia: *Nassarius albus* (1), *Polinices lacteus* (1), and Tonnidae (1). A specimen of *I. globulus* carrying the gastropod shell of *Polinices lacteus* (Guilding, 1834) had colonial hydroids *Podocoryne* n. sp. situated around the shell's aperture. The holotype of *I. globulus* was inhabiting an unrecognizable gastropod shell, completely absorbed by the flesh of a colonial sea anemone (Order Zoanthidea) encrusted with sand grains; three spermatophores were attached to the shell's aperture; this kind of association with shell-absorbing actinians, is the

first record for the genus *Iridopagurus*. One male *I. globulus* from GERDA station 681 was the host of 2 specimens of an undetermined rhizocephalan attached to the left side of the abdomen, just above pl₁. No external effects of the parasites were observed.

Distribution.—The present collections comprise specimens of *I. globulus* collected in the Straits of Florida; the Northwest Providence Channel, Bahama Islands; off Barbados, and Golfo de Uraba, Colombia; these two latter localities are new records for *I. globulus*.

The type locality was erroneously attributed to Florida but the station's position actually is in the Northwest Providence Channel, Bahamas.

The depth range from which *I. globulus* has been collected for the present study is 73–472 m; the range, based on a previous record (De Saint Laurent-Dechancé, 1966a) was 256–709 m; *I. globulus* was considered then the deepest of the known species of *Iridopagurus*, but with the present records, *I. iris* has slightly surpassed it.

Remarks.—As previously indicated, I found that A. Milne-Edwards and Bouvier (1893) confounded two distinct taxa in their description of *Spiropagurus iris*; two of the 6 female paratypes of this series were not conspecific with the holotype of *S. iris*, but rather belonging to an unrecognized taxon. These two females are identical with *Iridopagurus globulus*. The subrectangular configuration of the anterior lobe of the sternite of P₃, the less spinose ambulatory legs, the more setose ventromesial margin of propodi of P₂ and P₃ and the more reduced crista dentata of MXP₃, easily distinguish *I. globulus*.

Iridopagurus margaritensis new species

Figures 1, 2

Spiropagurus dispar: Provenzano, 1961 (in part). Also see *I. caribbensis*.

Holotype.—♂ (SL = 2.1 mm); USNM 189363.

Paratypes.—See material examined, Table 6.

Type Locality.—Seventeen miles north of Isla de Margarita, Venezuela; PILLSBURY station 718: 11°22.5'N, 64°08.6'W.

Diagnosis.—Chelipeds with 1 or 2 rows of short spines on middorsal line and dorsomesial and dorsolateral margins; ambulatory legs with 2–5 corneous spines on ventromesial face of dactyls; sternites of P₄ and P₅ with inflated setae (in males and large females); anterior lobe of sternite of P₃ semisubcircular.

Description.—Shield slightly broader than long; anterolateral margins slightly terraced, anterior margin between rostrum and lateral projections concave and with scattered tufts of short setae; posterior margin roundly truncate; dorsal surface smooth and with scattered, occasionally numerous, tufts of moderately long setae; anterolateral angle produced, unarmed. Rostrum rounded, usually slightly overreaching lateral projections, unarmed but with terminal tufts of short setae. Lateral projections obtusely triangular, each terminating in moderately strong submarginal spine, directed exteriorly.

Ocular peduncles moderately short, approximately two-thirds to three-fourths length of shield, cylindrical, moderately dilated in corneal region; dorsomesial face with longitudinal row of tufts of short setae. Ocular acicles reaching mesial base of ocular peduncles; separated basally by approximately entire basal width of one acicle.

Table 5. Material examined of *Iridopagurus globulus* De Saint Laurent-Dehancé, 1966

Locality		Depth (m)	Station	Date	Sex			SL (mm)	Collector
			Deposition		♂	♀	ov		
Bahama Islands									
25°20.0'N	79°15.0'W	256–347	G-239 —	30-01-64	1			2.5	RSMAS
26°05.0'N	78°49.0'W	322–366	G-522 USNM:154571	03-03-65	1			2.7	RSMAS
26°05.0'N	78°49.0'W	322–366	G-522 —	03-03-65		1		2.6	RSMAS
25°52.0'N	77°54.0'W	198–223	G-681 —	20-07-65	1		1	1.8	RSMAS
26°01.0'N	79°10.0'W	143–210	G-725 —	03-08-65	1			1.6	RSMAS
26°07.0'N	79°20.0'W	472	G-799 —	12-09-66	1			2.4	RSMAS
Colombia									
8°51.2'N	77°01.6'W	73	P-402 —	17-07-66		1		1.9	RSMAS
8°48.7'N	77°12.7'W	97–99	P-403 —	17-07-66	1	2		1.6–2.2	RSMAS
Barbados									
—		134	BLAKE-290 MCZ:4007	1878–1879		2		2.1, 2.2	A. Agassiz
—		—	NR:1-2 —	1969?		1		2.0	—

Antennular peduncles moderately long, usually exceeding ocular peduncles by three-fourths length of ultimate segment. Ultimate segment moderately long, dilated distally; dorsal surface with sparse longitudinal row of short setae, increasing in length distally, with distal fringe of long setae implanted in V; mesial face and ventral margin each with sparse row of very short setae. Penultimate segment with few short setae on dorsal and ventral surfaces. Basal segment with strong acute spine on distolateral margin.

Antennal peduncles exceeding ocular peduncles by one-half length of ultimate segment; with supernumerary segmentation. Fifth segment with dorsal surface and ventral margin each with row of tufts of moderately long setae. Fourth segment with moderately long setae on mesiodistal and laterodistal margins. Third segment with strong acute spine and moderately long setae at ventrolateral distal angle; lateral face with oblique row of tufts of short setae increasing in length near dorsolateral distal angle. Second segment with dorsolateral distal angle produced, terminating in moderately acute simple spine, dorsomesial margin slightly expanded and with tufts of moderately long setae, lateral face straight and with row of moderately long setae; dorsal surface with weak longitudinal sulcus, dorsomesial distal angle with strong acute spine. First segment with ventrodistal margin strongly produced, and with 3 to 5 spines laterally. Antennal acicles moderately long usually reaching distal third of ultimate peduncular segment, strongly arcuate, terminating in short spine encircled by long setae; dorsal margin and distal half of ventral margin, each with row of tufts of moderately long stiff setae. Antennal flagella long, overreaching extended pereopods; each article with 4 to 6 short bristles.

Mandible without distinctive characters. Maxillule with proximal endite strong-

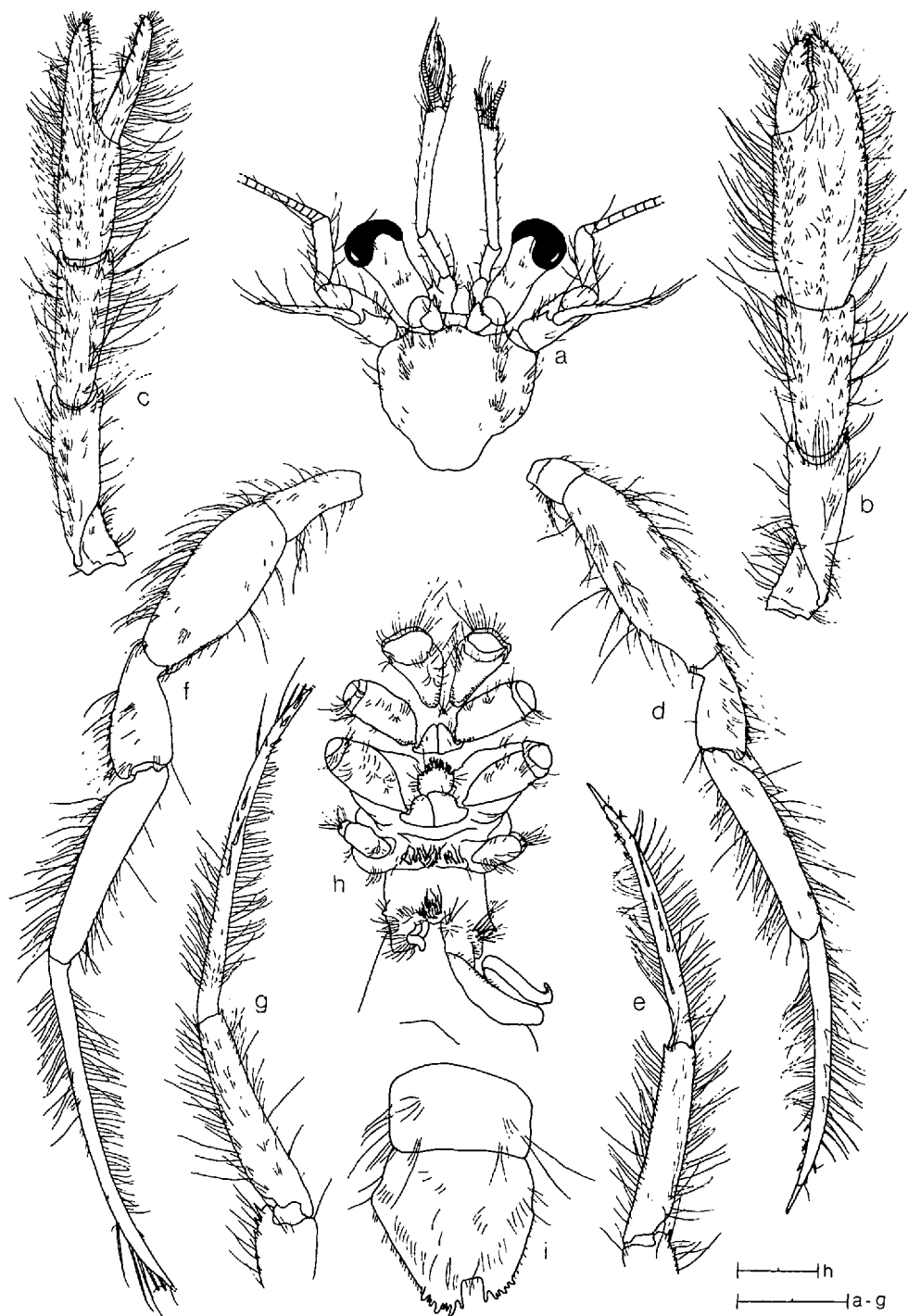


Figure 1. *Iridopagurus margaritensis* n. sp., a, shield and cephalic appendages; b, right cheliped (dorsal view); c, left cheliped (dorsal view); d, 2nd right pereopod (lateral view); e, 2nd right pereopod, dactyl and propodus (mesial view); f, 3rd left pereopod (lateral view); g, 3rd left pereopod, dactyl and propodus (mesial view); h, thorax, appendages removed (ventral view); i, telson and last abdominal segment. Scales equal 0.5 mm (h) and 2 mm (a-g).



Figure 2. *Iridopagurus margaritensis* n. sp., mouthparts (left, internal face): a, mandible; b, maxillule; c, maxilla; d, 1st maxilliped; e, 2nd maxilliped; f, 3rd maxilliped. Scales equal 0.5 mm (b-d) and 1 mm (a, e-f).

Table 6. Material examined of *Iridopagurus margaritensis* new species

Locality	Depth (m)	Station	Date	Sex				SL (mm)	Collector	
		Deposition		♂	♀	ov	J			
Cay Sal Bank										
Off S.W. Elbow Cay	26	ANSP-520 —	01-05-60	1				2.8	J. Boelke	
Bahama Islands										
1 mile west of Lerner Lab, near Rock Patches, Bimini	—	— UMML-32:4682	12-11-62	1					3.0	H. Feddern
0.75 mile west of Riding Rock Light	—	— UMML-32:3814	04-01-62	1				2.3	Starck & Davis	
24°15.5'N 77°37.3'W	16-17.5	D-90 —	08-09-73	4	4	2		1.2-2.0	J. C. Markham	
24°14.4'N 77°36.6'W	15	D-81 —	06-09-73	1	2			1.7-2.9	J. C. Markham	
24°14.5'N 77°36.6'W	16	D-85 —	07-09-73	13	1	6	1	0.8-2.9	J. C. Markham	
21°50.5'N 72°20.8'W	15	D-73 —	01-09-73	1				2.5	J. C. Markham	
Hispaniola										
19°23'N 69°20.5'W	53	SB-5176 —	16-10-63	1					USFWS	
Puerto Rico										
Off Desecheo Island	18	— Dept. Mar. Sci. Univ. de Puerto Rico	23-08-79	2	4			2.1-3.5	L. Meiklejohn	
Lesser Antilles										
Yawzi Pt., Lameshur Bay, St. John, U.S. Virgin Islands	11-14	SJHK-59-65 UMML-32:1904	15-06-59	1					3.6	R. Work & H. Kumpf
18°29.7'N 63°17.0'W	31	P-986 —	22-07-69	1				3.1	RSMAS	
17°26.6'N 62°51.5'W	11	P-961 —	19-07-69					1	2.4	RSMAS
14°53.8'N 61°04.9'W	46-48	P-913 —	10-07-69	1				2.9	RSMAS	
12°13.0'N 69°05.4'W	15	D-146 —	13-04-74	3	2			1.6-2.7	J. C. Markham	
Off Carmabi, Curaçao	15-23	Dept. Mar. Sci. Univ. de Puerto Rico	09-01-79	7	2	2		1.8-2.7	L. Meiklejohn	
Venezuela										
11°08.8'N 62°46.5'W	46	P-709 —	19-07-68	1				2.4	RSMAS	
11°22.5'N 64°08.6'W	—	P-718 USNM-189363	20-07-68	1					2.1	RSMAS
11°22.5'N 64°08.6'W	—	P-718 —	20-07-68	37	9	21		1.5-3.0	RSMAS	
11°04.0'N 64°44.0'W	91	P-722 —	21-07-68	5	2	5		1.8-3.6	RSMAS	
10°20.0'N 65°02.0'W	64	P-727 —	21-07-68	2	1	3		1.5-2.7	RSMAS	
10°22.5'N 65°23.0'W	86	P-728 —	21-07-68	2				2.2-2.3	RSMAS	
10°20.0'N 65°41.0'W	57-60	P-731 —	22-07-68	1				2.4	RSMAS	

Table 6. Continued

Locality		Depth (m)	Station	Date	Sex				SL (mm)	Collector
			Deposition		♂	♀	ov	J		
11°01.8'N	65°34.2'W	60–68	P-734 —	22-07-68	2				1.8, 2.7	RSMAS
11°54.5'N	66°54.5'W	23–27	P-746 —	24-07-68	1		1		2.0, 2.4	RSMAS
10°37.0'N	67°57.9'W	59	P-749 —	25-07-68	2				2.2, 2.6	RSMAS
Colombia										
12°33.4'N	71°10.8'W	64–66	P-768 —	28-07-68	2				1.9, 2.4	RSMAS
12°17.0'N	72°15.0'W	60–64	P-773 —	29-07-68	1		1		2.0, 2.4	RSMAS
12°13.0'N	72°25.0'W	68	O-5699 —	12-10-65	1				2.1	USFWS
12°05.0'N	72°38.5'W	79–82	P-775 —	29-07-68	2		2		1.7–2.1	RSMAS
11°39.0'N	73°08.5'W	18–27	P-780 —	30-07-68	1				2.4	RSMAS
Off Santa Marta		—	24 —	1976	7		1		1.4–2.0	H. Sánchez Moreno
10°40.0'N	75°31.0'W	27–29	P-793 —	01-08-68	1				2.1	RSMAS
Honduras										
16°16.0'N	82°26.5'W	68	P-574 UMML-32:4678	20-05-67		1			1.5	RSMAS
Guyana										
07°42.0'N	57°32.0'W	57	P-688 —	15-07-68	3	2			1.6–2.0	RSMAS
07°00.0'N	57°08.0'W	26–27	P-686 —	15-07-68		1			2.3	RSMAS
07°19.0'N	57°51.0'W	55–59	P-684 —	14-07-68	1				1.9	RSMAS
French Guiana										
06°07.0'N	52°19.0'W	84–91	P-650 —	08-07-68	1				2.4	RSMAS

ly tapering; endopodite with tuft of moderately long setae basally, and 1 stiff moderately long bristle on slightly produced internal lobe, external lobe slightly produced, not recurved, external endopodal margin with row of short stiff setae, interspersed with long plumose setae distally. Maxilla with endopodite inflated basally, reflexed, exceeding scaphognathite in distal extension. First maxilliped with endopodite approximately one-half length of exopodite; exite slightly produced; basal segment of exopodite moderately inflated. Second maxilliped with ischium with a blunt spine encircled by moderately long plumose setae. Third maxilliped with coxa with strong spine encircled by moderately long plumose setae; basis with 3 short spines obscured by short serrate setae; ischium with crista dentata with 10–14 corneous teeth; merus with moderately long spine on dorsodistal margin. Sternite of MXP₃ usually unarmed, occasionally with 1 or 2 spinules on each side of shallow median cleft, obscured by moderately long setae.

Chelipeds subequal. Right stronger and slightly longer than left. Dactyl short,

approximately one-half length of palm, unarmed; cutting edge with 2 prominent calcareous teeth proximally, separated by smaller calcareous teeth; short corneous teeth distally, usually with subterminal small calcareous tooth and terminal small corneous claw, slightly overlapped by fixed finger; with slender longitudinal hiatus; dorsal surface slightly elevated in midline and with scattered tufts of moderately long setae; mesial margin with row of tufts of moderately long plumose setae; ventral surface with rows of tufts of moderately long setae near mesial margin and cutting edge. Palm subrectangular slightly longer than carpus; somewhat inflated dorsoventrally; dorsomesial margin with 1 row of short spines and in larger specimens 1 or 2 additional irregular rows of short spines on distal half, also with tufts of moderately long setae; dorsal surface slightly convex, with 1 or 2 irregular rows of short spines in midline proximally, and with scattered tufts of moderately long setae; dorsolateral margin with 1 or 2 irregular rows of short spines, extending onto fixed finger proximally, and tufts of moderately long setae; cutting edge of fixed finger with prominent calcareous tooth, proximally and corneous teeth interspersed with few calcareous teeth distally, terminating in small corneous claw, encircled by tufts of short setae; mesial face slightly flattened, lateral face somewhat convex, each with row of moderately long plumose setae; ventrolateral margin with 2 short corneous subterminal spines, near claw; ventral surface with scattered tufts of short setae. Carpus trapezoidal in cross section, equalling or slightly exceeding length of merus, slightly inflated ventrally, equalling palm in depth; dorsal surface slightly convex, and with 2 rows of strong acute spines increasing in size distally; lateral face in larger specimens with irregular rows of short acute spines; ventrolateral distal angle with strong acute spine; all surfaces with moderately long scattered setae. Merus triangular; dorsal margin glabrous proximally but with row of moderately long setae distally; mesial face with sparse rows of tufts of short setae near dorsal margin and in midline; lateral face with scattered tufts of moderately long setae; ventral surface usually glabrous, occasionally tuberculate or spinulose in larger specimens, with tufts of moderately long setae; ventrodistal margin with row of spinules ending in strong spine at ventrolateral angle and to a lesser extent at ventromesial angle, all spines partially obscured by tufts of long setae. Ischium usually unarmed in small specimens, in larger specimens often with row of 6 to 9 spinules and moderately long setae on ventromesial margin; larger specimens with 1 spinule obscured by moderately long setae on ventrolateral margin; dorsal margin proximally and ventral surface each with tufts of short setae. Coxa with 2 or 3 small spines on ventrodistal margin, increasing in size laterally and few short setae; ventromesial margin with tufts of moderately long setae and 1 short acute spine at distal angle; ventrodistal margin with row of moderately long setae; ventrolateral and ventromesial margins proximally each with row of granules.

Left cheliped slender. Dactyl shorter than or equalling length of palm, unarmed; cutting edge with row of spatulate corneous teeth, terminating in small corneous claw, slightly overlapped by fixed finger; with slender longitudinal hiatus; dorsal surface slightly elevated in midline and with scattered tufts of moderately long setae; dorsomesial margin with moderately long plumose setae; ventral surface with row of tufts of short setae on midline, and with rows of tufts of moderately long setae near mesial margin and cutting edge. Palm subrectangular, slightly shorter than carpus; somewhat inflated dorsoventrally; dorsolateral margin with 1 row of short spines and, in larger specimens, with 1 additional row of short spines on distal half, also with tufts of moderately long setae; dorsal surface slightly convex, with 1 median row of short spines on proximal two-thirds and 2 median rows of short spines on distal third, and with scattered tufts of moderately long

setae; dorsomesial margin with row of short acute spines and moderately long setae; cutting edge of fixed finger with spinulose corneous teeth interspersed with few calcareous teeth; terminating in small corneous claw, encircled by tufts of short setae; mesial and lateral faces each with tufts of long or moderately long plumose setae; ventrolateral margin with 2 subterminal short corneous spines near claw; ventral surface with scattered tufts of short setae. Carpus trapezoidal in cross section, slightly shorter than merus, inflated ventrally, somewhat deeper than palm; dorsal surface somewhat convex and with 2 rows of strong acute spines increasing in size distally; lateral faces usually glabrous, occasionally in larger specimens, each with 1 irregular row of short acute spines near dorsolateral margin; ventrolateral distal angle with 1 strong acute spine; all surfaces with scattered moderately long setae. Merus triangular; dorsal margin glabrous proximally but with row of moderately long setae distally; mesial face with row of tufts of few short setae near dorsal margin and on midline; lateral face with tufts of moderately long setae near dorsal, ventral and distal margins; ventral surface usually tuberculate or spinulose and with tufts of moderately long setae; ventrodistal margin with row of spinules terminating with 1 strong acute spine at ventromesial angle, and in 2 to 4 strong acute spines at ventrolateral angle, all spines partially obscured by tufts of long setae; lateral face with tufts of moderately long setae near dorsal, ventral and distal margins. Ischium usually unarmed or, in larger specimens, with row of 3 to 8 spinules, and moderately long setae on ventromesial margin; ventrolateral margin with 1 spinule obscured by moderately long setae; dorsal margin proximally and ventral surface each with tufts of short setae. Coxa with 1 or 2 spinules on ventrolateral distal angle, increasing in size laterally, and few short setae; ventromesial margin with tufts of moderately long setae and 1 moderately strong acute spine at distal angle; ventrodistal margin with row of moderately long setae; ventrolateral and ventromesial proximal margins each with row of granules.

Ambulatory legs moderately long, usually overreaching chelipeds by approximately one-fourth length of dactyls of P_2 ; generally similar in armament and ornamentation. Dactyls moderately long and slender; exceeding length of propodi by one-fourth to one-third their own length; in lateral view curved ventrally; in dorsal view strongly twisted; terminating in relatively long corneous claws; dorsal margins each with moderately long plumose setae on proximal three-fourths and longer stiff setae on distal fourth; mesial faces each with row of short setae near dorsal margin, 2 or 3 irregular rows of short stiff setae on proximal fourth, and with median row of moderately long stiff setae on proximal three-fourths; row of 2 to 5 corneous spines on mesial face ventrally increasing in size distally, and row of moderately long plumose setae; ventral margins each with sparse row of moderately long setae; lateral faces each with sparse row of short setae near dorsal margin. Propodi moderately long, slightly twice length of carpi; dorsal margins each with row of paired setae composed of sets of 1 long plumose seta and 1 short stiff seta; dorsodistal margins each with row of moderately long plumose setae interspersed with short stiff setae; mesial faces each with sparse row of short setae near dorsal margin and on midline; ventromesial margins each with numerous moderately long plumose setae and with 1 short distal spine; ventral margins each with sparse row of relatively short setae; lateral faces each with row of tufts of short setae near dorsal margin. Carpi moderately short, one-half length of meri; dorsal surfaces each with row of 6 to 11 short spines, increasing in size distally, and with row of tufts of moderately long plumose setae, interspersed with few short stiff setae; mesial faces generally glabrous but with few short setae on distal margins; ventral surfaces with few short setae (P_2) or glabrous (P_3), ventromesial

and ventrolateral margins each with several short setae. Meri laterally compressed, moderately long; dorsal surfaces glabrous proximally but each with row of moderately long plumose setae on dorsodistal margin; mesial faces each with row of tufts of moderately long setae near dorsal and ventral margins, and P_2 with median tuft of short setae proximally; ventrolateral margins of P_2 each with 2 to 4 spinules on distal half partially obscured by moderately long setae, and with moderately strong spine at ventrolateral distal angle; ventrolateral margins of P_3 unarmed but with sparse row of short setae; lateral faces each with row of tufts of moderately long setae near dorsal margins, and P_2 each with additional row of tufts of moderately long setae near ventral margins. Ischia with dorsal margins with moderately long plumose setae; ventral margins with moderately long simple setae; mesial faces of P_2 each with tuft of short setae near ventral margins; lateral faces of P_3 each with row of tufts of short setae near dorsal margins. Coxae each with row of tufts of moderately long setae on ventromesial and ventrodistal margins; ventrolateral proximal margin of P_2 with row of granules and short setae. Anterior lobe of sternite of P_3 semisubcircular slightly skewed to left, anterior margin with 2 to 16 denticles, occasionally unarmed; denticles usually obscured by moderately long setae or commonly in males by inflated setae.

Fourth pereopods simple; dactyls each with 7 to 10 very small corneous scales; propodal rasp with single row of 8 to 11 corneous scales, extending approximately three-fourths length of ventral margin. Males with sternite of P_4 with row of moderately long inflated setae, grouped into 3 sets; large females with setae of median cluster inflated.

Fifth pereopods chelate. Left coxa and sternite of P_5 with moderately long setae, inflated in males, simple in females.

Males with left sexual tube well developed, coiled, occasionally partially retracted into sheath; right sexual tube short, occasionally absent or slightly produced and obscured by moderately long setae. Usually 3, rarely 4 biramous unpaired pleopods, with external rami moderately well developed, internal rami reduced. Spermatophores were observed attached to several parts of the abdomen, sternites and pereopods of 9 males, 4 females and 2 ovigerous females; one male had spermatophores of 2 sizes fastened on his sternum.

Females with 4 biramous unpaired pleopods; pl_2 with external ramus equalling or slightly shorter than internal; pl_3 – pl_5 with external rami moderately well developed, internal rami reduced.

Color.—Coloration pattern of formalin preserved specimen is kept for a long period of time; dactyls and fixed fingers white distally and along cutting edges; dorsodistal margin of palm adjoining dactyl red orange, delimiting its boundaries from dactyl. Recently preserved specimens in ethanol have an overall light violet color. Eyes with brown corneae; ocular peduncles yellow with brown patches, proximally and distally, shield and antennal peduncles with patches of mottled violet color. Chelipeds with violet band on dorsal surface of dactyl and fixed finger distally; also a violet band on dactyl outlining its margin with palm and continuing at same level across fixed finger proximally. Walking legs with dactyls each with a red orange circular band near tip.

Related Organisms.—Carcinoecia: *Nassarius albus* (9), *Polinices lacteus* (6), *Cerithium litteratum* (4), *Turritella* sp. (2), *Cerodrillia* sp. (1), *Collumbellidae* (1), *Coralliophila caribbaea* (1), *Leucosyrinx* sp. (1) and *Modulus modiolus* (1). Eight gastropod shells inhabited by *Iridopagurus margaritensis* n. sp. had colonial hydroids *Podocoryne* n. sp. attached to their apertures. Two shells were so concealed by a colonial bryozoan that impeded the identification of the gastropod.

Of the 172 specimens of *Iridopagurus margaritensis* n. sp. collected off the Caribbean coast of South America (PILLSBURY stations 718, 722, 749, 793), 12 specimens (11 male, 1 female) had rhizocephalan parasites fastened to the left sides of the abdomens; a male had 4 of these parasites; two specimens presented abdominal circular scars of these rhizocephalans. Four of the parasitized males had varying degrees of changes in the presumed secondary sexual characteristics, such as the absence of sexual tubes and inflated setae on sternites of P₃, P₄ and P₅; the male with the 4 brood chambers had his sexual tubes unaltered, but the normal pleopod number changed from 3 to 4, and the inflated setae of the sternites of P₃, P₄ and P₅ changed to simple setae (Reinhard, 1942). Three of the 11 specimens (2 males and 1 female) of *I. margaritensis* n. sp. collected off Curaçao had 2, 5 and 3 rhizocephalans respectively, also attached to the left sides of the abdomens. No external effects of the parasites were observed.

Two males (SL in mm = 2.3 and 2.6) collected off Portomaribaai, Curaçao (Station JCM:D-146) were parasitized by bopyrid isopods, *Stegophryxus hyptius* Thompson, 1902, which caused changes in the presumed secondary sexual characters of the host, having 4 pleopods and lacking sexual tubes (Baffoni, 1947); this host species is not only a new record for this parasite, but also the first recorded host not in the genus *Pagurus* (Markham, 1978).

Distribution.—*Iridopagurus margaritensis* n. sp. was collected off the Caribbean coast of Honduras and Cay Sal Bank and from the Bahama Islands southeast through the Hispaniola, the Lesser Antilles and the north coast of South America; the collection off the coast of French Guiana extends the southern and eastern ranges of this species. Its depth range is 11–91 m.

Remarks.—In his description of the color pattern of a species presumed to be *Spiropagurus dispar*, Provenzano (1961) included in his material one male specimen collected off Yawzi Point, Lameshur Bay, St. John, U.S. Virgin Islands. I have reexamined his collection and have found that this particular specimen should have been assigned to the new taxon, i.e., *I. margaritensis* n. sp. Although *I. dispar* (sensu Provenzano = *I. reticulatus* n. sp.) and *I. margaritensis* n. sp. have similar armature of the chelipeds, the latter species can be distinguished by the subrectangular configuration of the palms, which lack the reticulated color pattern, the much longer antennal acicles, and the semisubcircular contour of the anterior lobe of the sternite of P₃. Males also have characteristic inflated setae on sternites of P₄ and P₅ present only in one other species, i.e., *I. violaceus*. *Iridopagurus margaritensis* n. sp. can be separated from this latter species by the less spinose chelipeds and the more setose appearance of the propodi of P₂ and P₃. The species has been named *Iridopagurus margaritensis* for its type locality, Isla de Margarita, Venezuela.

Iridopagurus reticulatus new species

Figures 3, 4

Spiropagurus dispar: Provenzano, 1961: 165 (in part). See *I. sp. B.*—Williams, 1965: 133 (in part), not fig. 108 (not *Spiropagurus dispar* Stimpson, 1859). See also *I. caribbensis*.

Iridopagurus dispar: De Saint Laurent-Dechance, 1966a: 162, figs. 21, 25, 30, 35. [Not *Iridopagurus dispar* (Stimpson, 1859)]. See remarks.

Iridopagurus caribbensis: Herbst et al., 1978: 992 (misspelling of *I. caribbensis*).

Iridopagurus n. sp.: Markham and McDermott, 1980: 1271.

Holotype.—♂ (SL = 3.1 mm); USNM 189364.

Paratypes.—See material examined, Table 7.

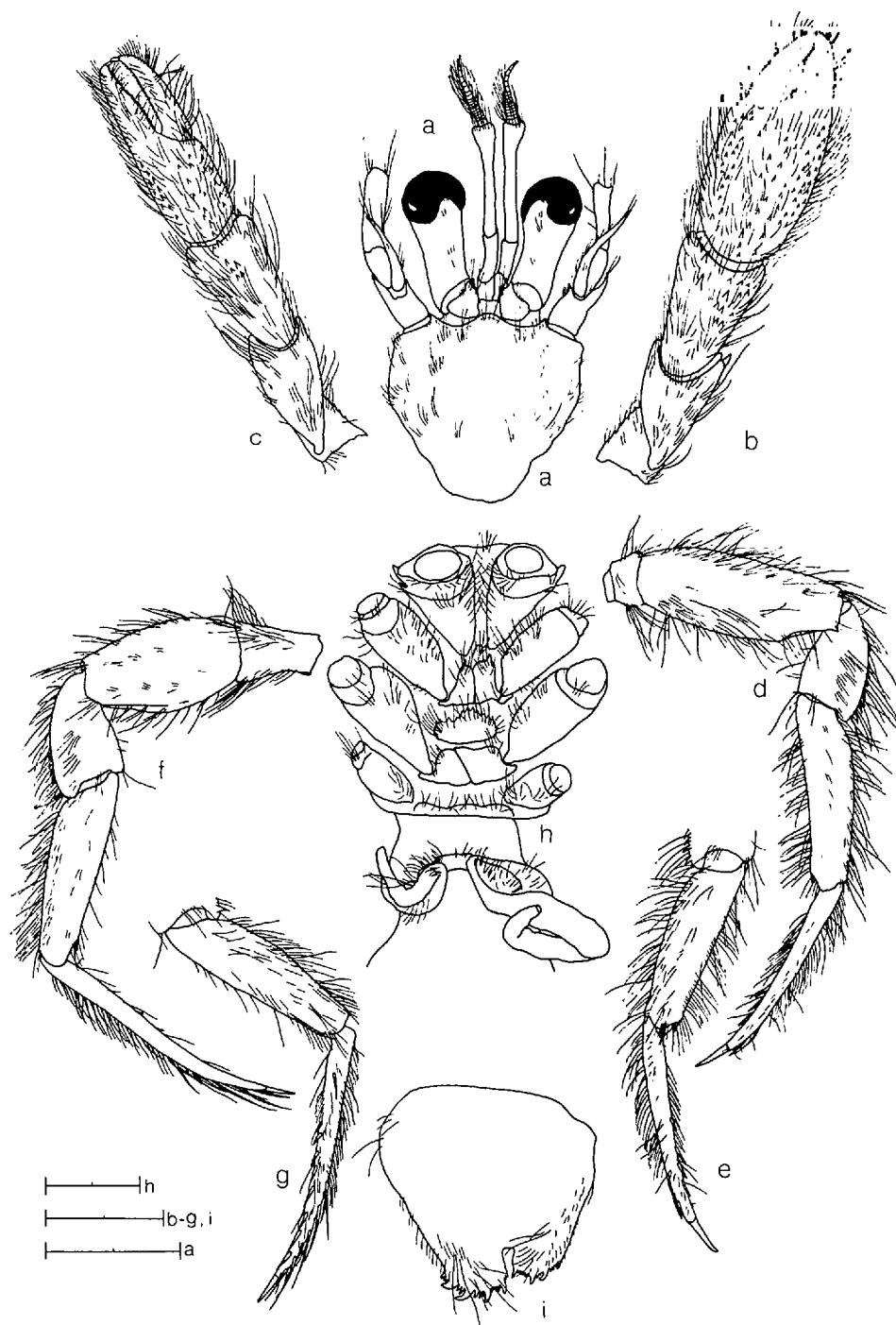


Figure 3. *Iridopagurus reticulatus* n. sp., a, shield and cephalic appendages; b, right cheliped (dorsal view); c, left cheliped (dorsal view); d, 2nd right pereopod (lateral view); e, 2nd right pereopod, dactyl and propodus (mesial view); f, 3rd left pereopod (lateral view); g, 3rd left pereopod, dactyl and propodus (mesial view); h, thorax, appendages removed (ventral view); i, telson. Scales equal 1 mm (h) and 2 mm (a-g, i).

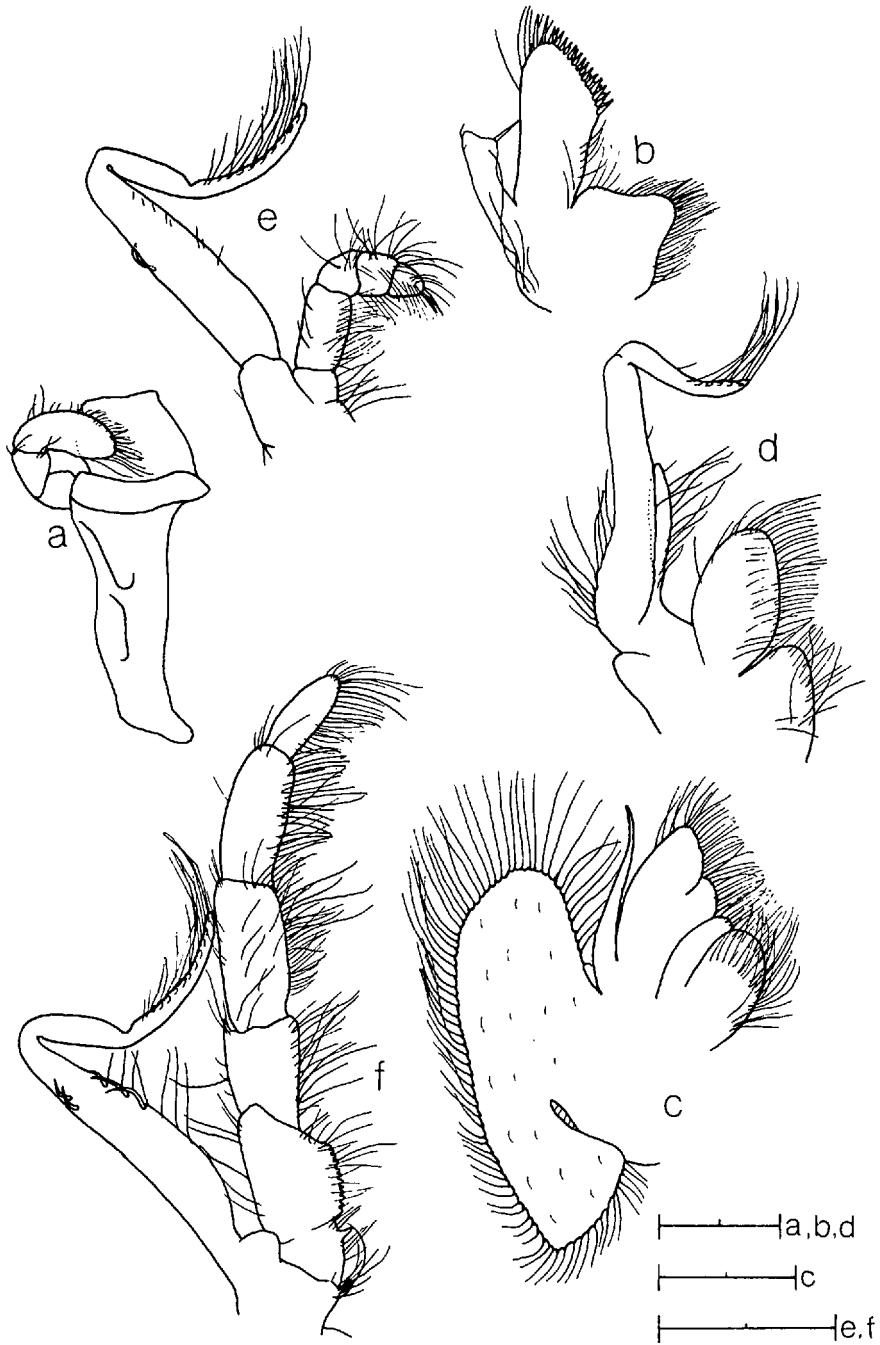


Figure 4. *Iridopagurus reticulatus* n. sp., mouthparts (left, internal face): a, mandible; b, maxillule; c, maxilla; d, 1st maxilliped; e, 2nd maxilliped; f, 3rd maxilliped. Scales equal 0.5 mm (c), 1 mm (e, f) and 2 mm (a, b, d).

Table 7. Material examined of *Iridopagurus reticulatus* new species

Locality	Depth (m)	Station	Date	Sex			SL (mm)	Collector
		Deposition		♂	♀	ov		
Bermuda	—	BBSR-57-026-01	12-07-79	1			2.0	J. C. Markham
North Carolina								
34°37.3'N 76°9.2'W	36	Eastward Cruise E8-77 sta. 13 Acc. No. 77-24	18-10-77	1		1	1.6	G. Herbst
Off Eastern U.S.								
—		L-2 —	-06-63			1	0.9	—
Florida East Coast								
Off second reef, Hollywood Beach	8-9	— —	08-07-75	1			3.0	R. Guest
Bahama Islands								
Off Cay Sal, Cay Sal Bank	—	6706-8 TABL67-320	12-12-67			2	2.4, 2.5	—
Off S.W. coast of Anguilla Cays, Cay Sal Bank	15	BELLOWS-8 —	21-05-80	1			3.5	R. Lemaitre
Off West End, Grand Bahama Island	1	— UMML-32:4681	Fall 1964	1			2.4	B. Hazlett
Off Sandy Point, Great Abaco Island	—	— —	1960	2			2.3, 3.0	J. Storr
24°15.5'N 77°37.3'W	16-18	D-90 —	08-09-73	1	1	1	1.1-1.9	J. C. Markham
24°14.4'N 77°36.6'W	16	D-85 —	08-09-73	1		1	1.7	J. C. Markham
Off north coast of Crooked Island	3-5	— USNM-189364	-09-76	1			3.1	R. Guest
Off north coast of Crooked Island	3-5	— —	-09-76	3			2.6-3.3	R. Guest
East side of channel; Ragged Island	10	— —	23-08-73	1			2.0	P. Colin
Dominican Republic								
Off Santo Domingo	18	— Dept. Mar. Sci. Univ. de Puerto Rico	-05-79			1	2.4	P. L. Colin
Puerto Rico								
Off Desecheo Island	18	— Dept. Mar. Sci. Univ. de Puerto Rico	23-08-79	8	2	3	1.5-3.0	L. Meiklejohn
Enrique Reef, off La Parguera	1	— Dept. Mar. Sci. Univ. de Puerto Rico	02-03-79	1		1	3.3, 2.6	R. Waldner
Lesser Antilles								
Off Yawzi Pt., Great Lameshur Bay, St. John, U.S. Virgin Islands	9	SJHK:58-31 UMML-32:1900	21-12-58		1		3.0	L. Thomas & J. Randall
Concordia Bay, St. John, U.S. Virgin Islands	6-12	SJHK:59-13 UMML-32:1901	29-01-59		1		2.8	H. Kurnpt
Reef Bay, St. John, U.S. Virgin Islands	21	— —	15-08-62	2			2.8, 3.0	J. Randall
Salt River Canyon, St. Croix, U.S. Virgin Islands	15	— Dept. Mar. Sci. Univ. de Puerto Rico	-09-79	5		5	1.3-3.0	J. Kiminel
17°28.7'N 63°27.0'W	16-18	P-963 —	20-07-69	1			1.6	RSMAS

Table 7. Continued

Locality		Depth (m)	Station	Date	Sex			SL (mm)	Collector
			Deposition		♂	♀	ov		
17°43.8'N	62°01.6'W	38	P-973 —	21-07-69	1			2.2	RSMAS
17°08.3'N	62°03.6'W	18	P-966 —	19-07-69		1		1.7	RSMAS
Off Watson's Beach, Antigua		—	— —	06-08-69	2	2		2.0-3.1	J. Shoup
Kralendijk Bay, Bonaire		2	— —	-06-75	1			2.6	R. Guest
Venezuela									
11°22.5'N	64°08.6'W	—	P-718 —	20-07-68	2			2.1	RSMAS
11°06.5'N	64°22.5'W	26-27	P-721 —	21-07-68	2			1.3, 2.0	RSMAS
11°52.0'N	70°22.0'W	35	P-761 —	27-07-68	1			2.4	RSMAS
Curaçao									
Off Carmabi		15-23	— Dept. Mar. Sci. Univ. de Puerto Rico	09-01-79	2			2.0, 2.4	L. Meiklejohn
Colombia									
12°16.1'N	71°03.3'W	24-26	P-767 —	28-07-68	2			2.2, 2.3	RSMAS
12°20.2'N	71°35.1'W	11	P-772 —	29-07-68	1			2.4	RSMAS
Off Santa Marta		—	— —	—	2			2.0, 2.2	—
Off Rodadero, Santa Marta		3.0	II INVEMAR	08-05-80	1			2.0	D. Rodríguez
Off Gairaca, Santa Marta		1.0	I INVEMAR	18-10-80	1			1.9	D. Rodríguez
10°40.0'N	75°31.0'W	27-29	P-793 —	01-08-68	1			1.8	RSMAS
Off Isla Skandia, Archi- piélago Ntra. Sra. del Rosario			— INDERENA	10-05-80		1		2.7	J. H. Sandoval
Off Isla Skandia, Archi- piélago Ntra. Sra. del Rosario		2	— INDERENA	11-05-80		1		3.0	F. Duque
Caribbean									
Off northwest coast, Grand Cayman Island		3	— —	26-06-77		1		3.2	R. Guest
Off Belize		33	— —	-06-80		1		2.0	J. D. Thomas
Jamaica, off Chalet Caribe		5	— Dept. Mar. Sci. Univ. de Puerto Rico	11-01-80		1		2.1	G. Harvey
Barbados									
—		5	— ZMKD	03-06-76		1		0.8	T. Wolff
Surinam									
06°12.0'N	55°19.0'W	7	P-665 —	10-07-68		1		1.8	RSMAS
French Guiana									
06°07.0'N	53°39.0'W	27	P-655 —	09-07-68	1			1.1	RSMAS

Type Locality.—Off north coast of Crooked Island, Bahama Islands; 3–5 m.

Diagnosis.—Chelipeds moderately spinose, palms with reticulated color pattern; anterior lobe of sternite of P_3 roundly rectangular.

Description.—Shield slightly broader than long; anterolateral margins slightly terraced, anterior margin between rostrum and lateral projections concave and with scattered tufts of short setae; posterior margin roundly truncate; dorsal surface smooth and with scattered tufts of moderately long setae, anterolateral angle produced, unarmed. Rostrum rounded, slightly exceeding lateral projections, unarmed, but with terminal tufts of moderately long setae. Lateral projections obtusely triangular, each terminating in moderately strong submarginal spine, directed toward exterior.

Ocular peduncles moderately short, approximately three-fourths length of shield, cylindrical, slightly dilated in corneal region; dorsomesial face with longitudinal row of tufts of short setae. Ocular acicles reaching mesial base of ocular peduncles; separated basally by three-fourths to entire basal width of one acicle.

Antennular peduncles moderately long, exceeding ocular peduncles by one-third to one-half length of ultimate segment. Ultimate segment moderately long, dilated distally; dorsal surface with few very short setae, and with fringe of long setae distally implanted in V. Penultimate segment with few short setae on dorsal face. Basal segment with strong acute spine on laterodistal margin.

Antennal peduncles equalling or slightly exceeding length of ocular peduncles; with supernumerary segmentation. Fifth and fourth segments with few scattered tufts of relatively long setae. Third segment with strong acute spine, encircled by long setae on ventrodistal margin; ventrolateral distal margin with long setae; mesial margin with moderately long setae. Second segment with dorsolateral distal angle, produced, terminating in moderately acute bifid spine, mesial margin slightly expanded and with tufts of short setae, lateral margin straight; dorsal surface with weak longitudinal sulcus, dorsomesial distal angle with strong acute spine. First segment with 3 or 4 spines laterally on ventrodistal margin. Antennal acicles moderately short usually not exceeding proximal third of ultimate peduncular segment, strongly arcuate, terminating in small spine; mesial margin with row of scattered stiff setae. Antennal flagella long, overreaching extended pereopods; each article with 1 to 6 short bristles.

Mandible without distinctive characters. Maxillule with proximal endite strongly tapering, endopodite with tuft of moderately long setae basally, and stiff moderately long bristle on slightly produced internal lobe, external lobe produced, not recurved, external endopodal margin with row of short stiff setae and tuft of moderately long stiff setae distally. Maxilla with endopodite inflated basally, reflexed, exceeding scaphognathite in distal extension. First maxilliped with endopodite approximately one-half length of exopodite; exite slightly produced; basal segment of exopodite moderately inflated. Second maxilliped without distinguishing characters. Third maxilliped with coxa with strong spine encircled by moderately long plumose setae; basis with short spine obscured by moderately long serrate setae; ischium with crista dentata with 12 to 16 corneous teeth; merus with short spine on dorsodistal margin. Sternite of m_{xp}_3 with shallow median depression and numerous moderately long plumose setae.

Chelipeds subequal. Right stronger than left, but approximately equal in length. Dactyl short, approximately one-half to two-thirds length of palm, usually unarmed or occasionally with row of spinules on dorsomesial margin proximally; cutting edge with 2 prominent calcareous teeth proximally, corneous teeth distally;

terminating in small corneous claw, slightly overlapping fixed finger; with slender longitudinal hiatus; dorsal surface elevated in midline region and with scattered tufts of moderately long setae; dorsolateral margin with row of moderately long setae; dorsomesial and ventromesial margins with scattered tufts of short setae. Palm ovate, one-fourth greater than length of carpus; dorsomesial margin with 2 irregular rows of short spines and moderately long setae; dorsal surface slightly convex, and with few irregular rows of short spines and numerous tufts of moderately long setae; dorsolateral margin with several irregular rows of short spines and numerous tufts of moderately long setae; cutting edge of fixed finger with prominent calcareous tooth proximally and corneous teeth interspersed with few calcareous teeth distally, terminating in small corneous claw, obscured by tufts of short setae, and with 4 subterminal spines laterally; ventral surface with few, scattered tufts of short setae. Carpus trapezoidal in cross section, somewhat longer than merus; slightly inflated ventrally, slightly deeper than palm; dorsal surface somewhat convex, dorsomesial margin with 3 to 5 strong spines distally, and transverse rows of moderately long setae; dorsolateral margin with 2 or 3 irregular rows of strong spines distally and tufts of moderately long setae; lateral, mesial and ventral surfaces each with several scattered tufts of moderately long setae; ventrolateral distal angle with strong spine, obscured by moderately long setae. Merus triangular; dorsal margin, and mesial and lateral faces dorsally, each with tufts of moderately long setae; ventromesial and ventrolateral margins each with row of 2 to 4 spines, increasing in size distally, stronger laterally. Ischium with row of short spines and moderately long setae on ventromesial margin. Coxa with 2 or 3 spines on ventrodistal margin, increasing in size laterally; ventromesial margin with tufts of long setae and 1 spine at distal angle.

Left cheliped slender. Dactyl usually equalling or slightly exceeding length of palm, usually or occasionally with row of spinules on dorsomesial margin proximally; unarmed cutting edge with row of small corneous teeth, partially obscured by tufts of short setae; terminating in small corneous claw, frequently overlapped by fixed finger; dorsal surface elevated in midline and with scattered tufts of moderately long setae; dorsomesial and ventromesial margins with numerous tufts of moderately long setae; ventral surface with few scattered tufts of short setae. Palm somewhat rectangular, approximately three-fourths length of carpus; dorsomesial margin with 2 irregular rows of short spines and moderately long setae; dorsal surface slightly elevated in midline and with few scattered rows of short spines and moderately long setae; dorsolateral margin with 2 irregular rows of short spines and numerous tufts of moderately long setae, cutting edge of fixed finger with corneous teeth interspersed with few calcareous teeth, terminating in small corneous claw partially obscured by tufts of short setae, and with 2 subterminal spines laterally. Carpus equalling or slightly exceeding length of merus, trapezoidal in cross section, slightly inflated ventrally; dorsal surface somewhat rugose; dorsomesial margin with row of few strong spines distally and transverse rows of moderately long setae; dorsolateral margin with 2 rows of strong spines distally, and transverse rows of moderately long setae; ventral surface, and lateral and mesial faces, each with numerous tufts of moderately long setae; ventrolateral distal angle with strong spine. Merus triangular; dorsal margin, and mesial and lateral faces, each with tufts of moderately long setae; ventromesial and ventrolateral margins each with row of spines, increasing in size distally, partially obscured by row of moderately long setae. Ischium with row of small spines and moderately long setae on ventromesial margin. Coxa with 1 or 2 spinules on ventrodistal margin, ventromesial margin with tufts of long setae, and 1 spinule at distal angle.

Ambulatory legs moderately long, usually overreaching chelipeds by one-half length of dactyls of P_2 , generally similar in armament and ornamentation. Dactyls moderately long, usually exceeding propodi by approximately one-fourth to one-third own length; moderately slender; in lateral view, curved ventrally; in dorsal view, strongly twisted; terminating in relatively long corneous claw; dorsal margins each with moderately long plumose setae, stiffer distally; mesial faces each with irregular rows of stiff setae, more numerous proximally; ventromesial margins each with 3 to 8 corneous spines and row of moderately long plumose setae; ventral margins each with row of few moderately long setae; lateral faces each with oblique row of tufts of short setae. Propodi moderately long, usually exceeding length of carpi by one-third own length; dorsal margins each with row of moderately long plumose setae, interspersed with few stiff setae; mesial faces each with irregular row of tufts of stiff setae; dorsomesial margins each with row of tufts of relatively short setae; ventromesial margins each with distal short spine and numerous short plumose setae; lateral faces each with 2 rows of tufts of short setae, 1 medially and 1 near dorsal margin; ventral margins each with few moderately long setae. Carpi approximately one-half length of meri; dorsal surfaces each with row of 5 to 14 short spines, increasing in size distally, and with row of tufts of moderately long plumose setae; lateral faces each with row of tufts of moderately long setae and frequently, in large males, with row of short setae near ventral margin; ventral surfaces each with very few scattered short setae; ventrodistal margins each with row of moderately long setae; mesial faces glabrous or with few moderately long setae. Meri laterally compressed; dorsal surfaces each with row of tufts of moderately long plumose setae; ventrolateral margins of P_2 each with sparse row of spinules distally of frequently unarmed but with row of moderately long setae; ventrolateral margins of P_3 each with row of moderately long setae; lateral faces each with rows of tufts of moderately long setae, more numerous towards margins; mesial faces of P_2 with rows of moderately long setae; mesial faces of P_3 glabrous. Ischia with tufts of moderately long plumose setae on each dorsal and ventral margins; lateral and mesial faces each with few tufts of moderately long setae near margins; distolateral and distomesial margins each with few short setae. Coxae each with row of tufts of moderately long plumose setae on ventromesial margin; lateral faces each with few short setae; ventrodistal margin with row of moderately long plumose setae. Anterior lobe of sternite of P_3 roundly subrectangular, strongly skewed to left; anterior margin with 4 to 8 denticles on each side of shallow median depression, usually partially obscured by long setae.

Fourth pereopods with dactyls, each having 7 to 11 short corneous scales; preungual process absent. Propodal rasp with single row of 7 to 11 widely spaced corneous scales, encompassing approximately two-thirds of ventral margin; one or two proximal scales acuminate.

Fifth pereopods chelate.

Males with well developed coiled left sexual tube; right sexual tube short, directed externally, occasionally absent or only slightly produced and obscured by moderately long setae of coxa. Three biramous unpaired pleopods, with external rami moderately well developed, internal rami reduced.

Females with 4 biramous unpaired pleopods; pl_2 with external ramus slightly longer than internal; pl_3 to pl_5 with external rami moderately well developed, internal rami reduced.

Color.—Shield of living specimens with 3 pairs of pigment spots; branchiostegites light brown with large, clear or colorless spot; cornea deep brown, ocular peduncles

brown dorsally and ringed with brown proximally; narrow brown orange ring at middle of each dactyl and fixed finger, dorsal surface of palms reticulated with brown; pereopods each with broad band on dactyl; propodi each with dorsal and ventral brown patches, faint longitudinal lateral stripe, and a pair of dorsomedial brown patches; carpi each with 3 faint stripes laterally. Specimens usually retain a distinct color pattern in formalin (Provenzano, 1961).

Related Organisms.—Carcinoecia: *Polinices lacteus* (23), *Nassarius albus* (3), *Cerithium litteratum* (2), *Modulus modulus* (2), *Turbo castaneus* (2), *Alys riiseana* (1), *Cerithium eburneum algicola* (1), and *Neodrillia cydia* (1).

The apertures of 19 *Polinices lacteus* and 2 *Modulus modulus* inhabited by *I. reticulatus* n. sp. had colonial hydroids *Podocoryne* n. sp. Two specimens collected off Desecheo Island, Puerto Rico had each one rhizocephalan attached to the abdomens. No external effects of the parasites were observed.

Behavior.—A male, collected off Hollywood, Florida, lived in a running sea aquarium for almost 6 months; the initial shield length was 3.0 and through 5 molts he grew 0.4 mm; as soon as this specimen was placed in the tank, he partially buried himself in the sand using his long walking pereopods; he kept this hiding position during daylight hours except when fed; then he reacted vigorously, jumping out of the sand and catching the food while still in the water column before it reached the bottom.

A specimen collected off Grand Cayman Island was observed swimming distances up to 18 cm when disturbed (Guest, personal communication).

Distribution.—The record off the coast of North Carolina makes *I. reticulatus* n. sp. the most northern species of the genus *Iridopagurus*. This species has been collected off Bermuda, Hollywood Beach, Florida, Cay Sal, and from its northern range, off the Grand Bahama Island, southeast through various localities off the Bahama Islands, Jamaica, Dominican Republic, the U.S. Virgin Islands, the Leeward Islands and Bonaire in the Lesser Antilles, Venezuela, Curaçao, Colombia, Surinam and to its southern and eastern range, off French Guiana. The collections made off Grand Cayman Island and Belize extend the western range of this species. De Saint Laurent-Dechancé (1966a) also recorded the presence of this species off the coast of Curaçao.

The bathymetric distribution for the present collection is 1–38 m. De Saint Laurent-Dechancé (1966a) recorded the depth range of 1–15 m. This is the shallowest of all known Atlantic species of *Iridopagurus*.

Remarks.—As earlier discussed, Provenzano (1961), Williams (1965) and De Saint Laurent-Dechancé (1966a) were incorrect in assigning their specimens to Stimpson's taxon, basing their statements only on the reticulated pattern of the chelipeds described by Stimpson (1859) for *Spiropagurus dispar*. The first two authors erroneously synonymized *S. caribbensis* with *S. dispar*. As the type material of *S. dispar* has been apparently lost (Rathbun, 1883) we can only refer to Stimpson's brief description. I found that the material examined by Provenzano, Williams and De Saint Laurent-Dechancé had spinose and setose chelipeds and equilaterally triangular ocular acicles. I concluded that these specimens were not conspecific with Stimpson's taxon, and consequently they are assigned to a new taxon, i.e., *I. reticulatus* n. sp.

Considering the above statement, the reticulated pattern of the palms, which is usually retained in preserved material, and the roundly rectangular anterior lobe of the sternite of P₃, immediately distinguish *I. reticulatus* n. sp. from other members of *Iridopagurus*.

Iridopagurus haigae new species

Figures 5, 6a–g

Spiropagurus occidentalis: Glassell, 1937: 263 (in part).*Holotype*.—♂ (SL = 2.0 mm) USNM 189365; type locality: off Isla Angel de la Guarda, Gulf of California, AHF station 1080-40, 113–155 m.*Paratypes*.—See material examined, Table 8.

Diagnosis.—Chelipeds moderately spinose; fourth pereopods with type II preungual process; anterior lobe of sternite of P_3 subrectangular; merus of MXP_3 with moderately long spine on dorsodistal margin.

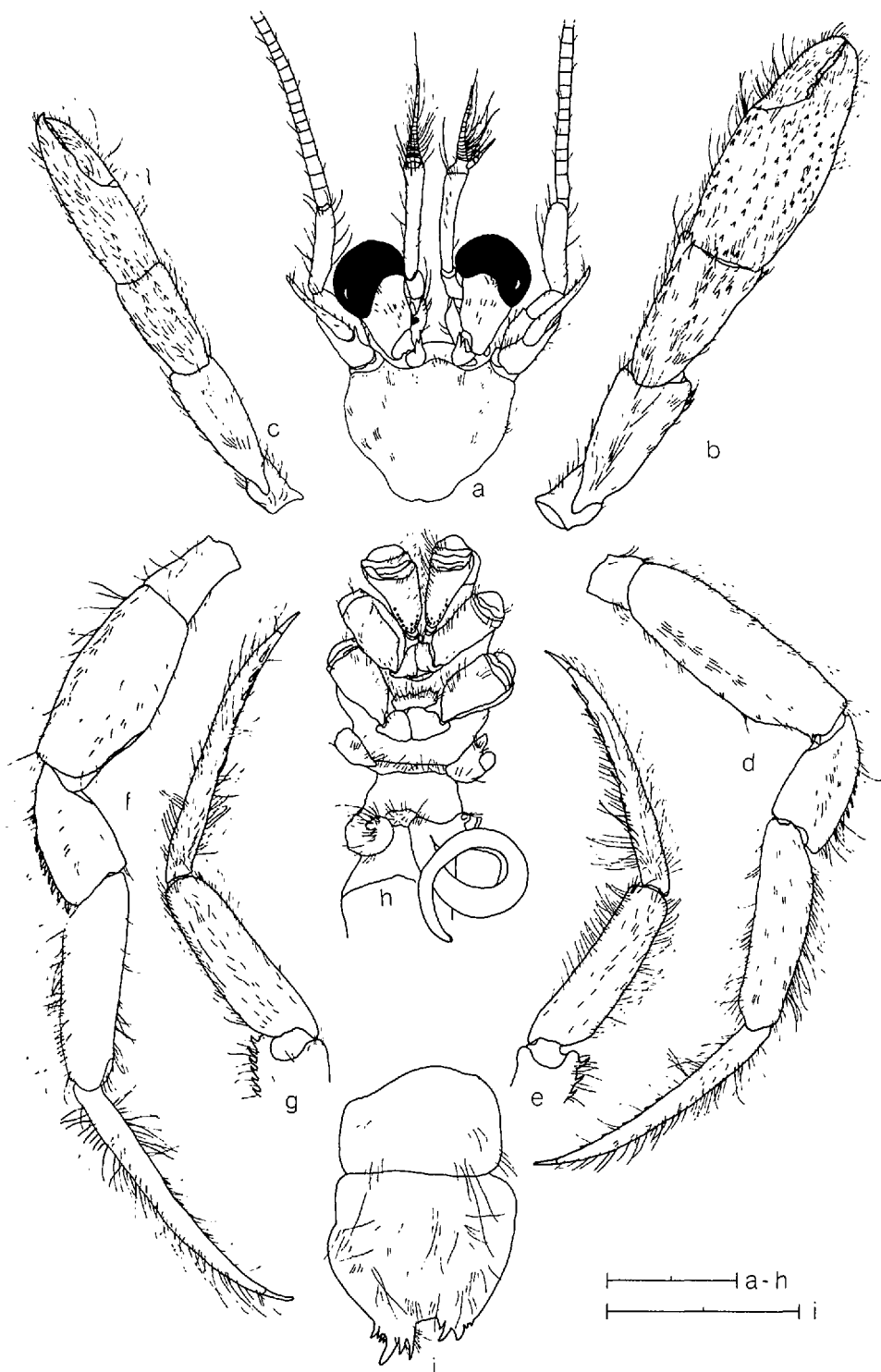
Description.—Shield broader than long; anterolateral margins slightly terraced, anterior margins concave and with scattered tufts of short setae; posterior margin roundly truncate; dorsal surface smooth and with scattered tufts of moderately long setae, anterolateral angle produced unarmed. Rostrum rounded overreaching lateral projections, unarmed but with tufts of moderately long setae. Lateral projections obtusely triangular, each terminating in moderately strong submarginal spine, directed exteriorly.

Ocular peduncles moderately short, approximately three-fourths length of shield, cylindrical, strongly dilated in corneal region; dorsomesial face with longitudinal row of short setae. Ocular acicles overreaching mesial base of ocular peduncles; separated basally by two-thirds to entire basal width of one acicle.

Antennular peduncles moderately long, usually exceeding ocular peduncles by three-fourths length of ultimate segment. Ultimate segment moderately long. Dilated distally; dorsal surfaces with longitudinal row of short setae, and with fringe of long setae implanted in V; mesial face and ventral margin each with sparse row of very short setae. Penultimate segment with few short setae on dorsal and ventral surfaces. Basal segment strongly dilated, with acute spine on distolateral margin and tufts of moderately long setae on ventrodistal margin; mesial and dorsolateral margins each with row of moderately short setae.

Antennal peduncles exceeding ocular peduncles by approximately one-third length of ultimate segment; with supernumerary segmentation. Fifth segment with dorsal surface and ventral margin, each with row of tufts of moderately long setae. Fourth segment with moderately long setae on mesiodistal and laterodistal margins. Third segment with short spine and moderately long setae at ventrolateral distal angle, lateral face with oblique row of setae. Second segment with dorsolateral distal angle produced, terminating in strong acute spine, dorsomesial margin slightly expanded and with tufts of moderately long setae, lateral face with row of moderately long setae; dorsal surface with weak longitudinal sulcus, dorsomesial distal angle with strong acute spine. First segment usually with 2 spines laterally on ventromesial margin and tufts of moderately long setae. Antennal acicles moderately short, usually not exceeding proximal third of ultimate peduncular segment strongly arcuate, terminating in short acute spine, encircled by long setae; dorsal margin and distal half on ventral margin, each with row of tufts of moderately long stiff setae. Antennal flagella moderately long, usually overreaching extended chelipeds, dorsoventrally depressed; each article with several minute bristles.

Figure 5. *Iridopagurus haigae* n. sp., a, shield and cephalic appendages; b, right cheliped (dorsal view); c, left cheliped (dorsal view); d, 2nd right pereopod (lateral view); e, 2nd right pereopod, dactyl and propodus (mesial view); f, 3rd left pereopod (lateral view); g, 3rd left pereopod, dactyl and propodus



(mesial view); h, thorax, appendages removed (ventral view); i, telson. Scales equal 1 mm (i) and 2 mm (a-h).

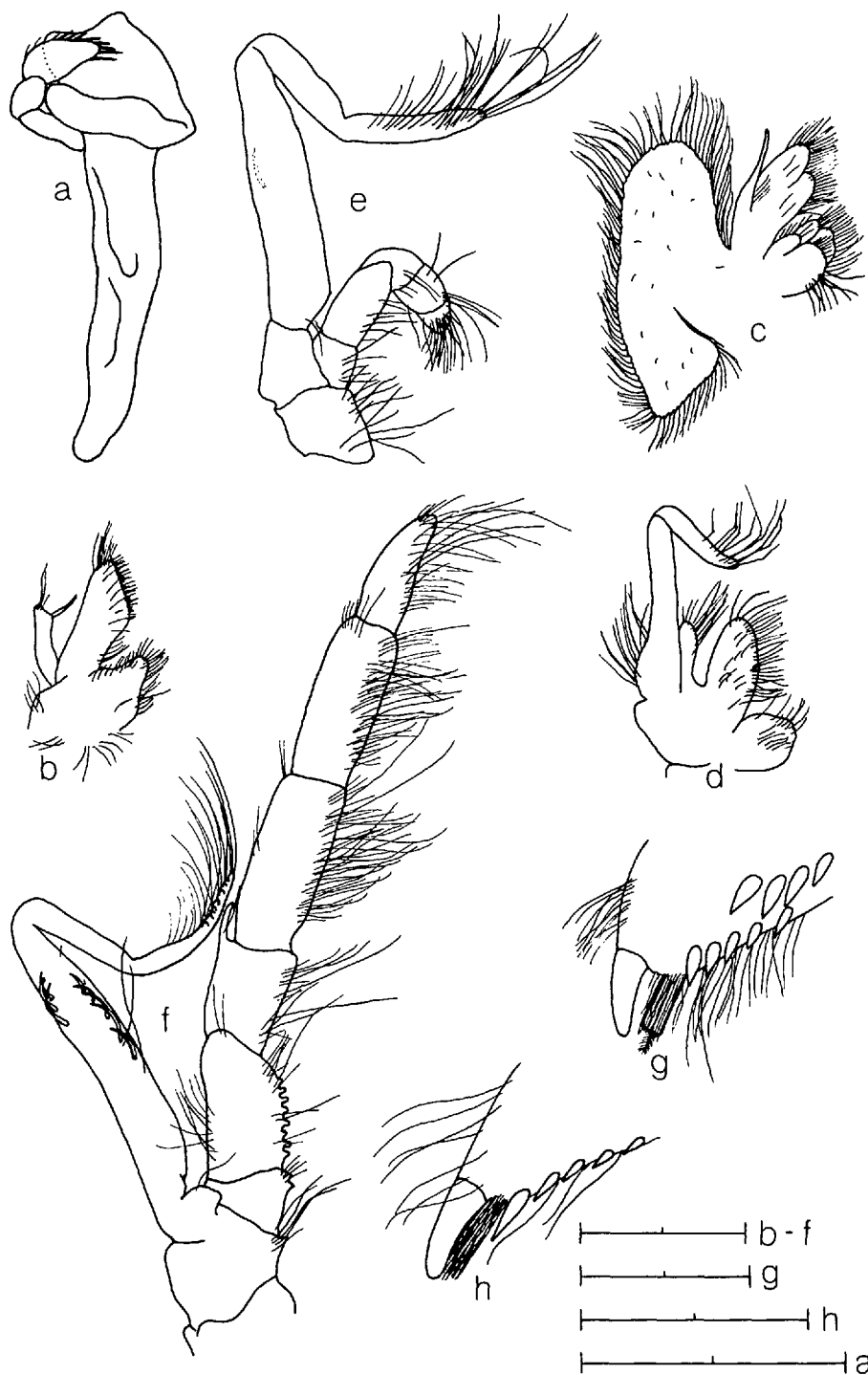


Figure 6. a-g. *Iridopagurus haigae* n. sp., a-f, mouthparts (left, internal face); a, mandible; b, maxillule; c, maxilla; d, 1st maxilliped; e, 2nd maxilliped; f, 3rd maxilliped; g, 4th left pereopod, dactyl (lateral view); h, *Iridopagurus globulus*, 4th left pereopod, dactyl (lateral view). Scales equal 0.25 mm (g, h) and 1 mm (a-f).

Table 8. Material examined of *Iridopagurus haigae* new species

Locality	Depth (m)	Station	Date	Sex			SL (mm)	Collector
		Deposition		♂	♀	ov		
Mexico								
South of Isla Coronados, Gulf of California	183–219	523-36 AHF-	28-02-36	2		1	1.8–2.0	Velero III
26°57'30"N 111°48'30"W	110	ZACA-14-7-d-2 AMNH-12558	17-04-36			1	1.6	W. Beebe
North of Punta Lobos, Sonora, Gulf of California	18	725-37 AHF-	26-03-37	4			2.0–2.6	Velero III
Puerto Refugio, Isla Angel de la Guarda, Gulf of California	143–165	1054-40	28-01-40	1			2.8	Velero III
Off Isla Angel de la Guarda, Gulf of California	113–155	1080-40 USNM-189365	05-02-40	1			2.0	Velero III
Off Isla Angel de la Guarda, Gulf of California	113–155	1080-40 AHF-	05-02-40	3	1		2.1–2.6	Velero III
Off Isla San Pedro Nolasco, Gulf of California	170–203	1084-40 AHF-	06-02-40	2			2.0–2.4	Velero III
Ranger Bank off Isla Cedros, Outer Coast of Baja California	143–152	1246-41 AHF-	25-01-41	1			1.9	Velero III
Galápagos Islands								
Northeast of Isla Floreana (Charles)	110	55-33 AHF-	05-02-33	1			2.3	Velero III
Off Isla Wenman	183–274	143-34 AHF-	11-01-34	6			1.5–2.2	Velero III
North of Isla Floreana (Charles)	128–146	195-34 AHF-	29-01-34	1			2.0	Velero III
Off Isla Daphne Minor	128–146	792-38 AHF-	20-01-39	4		1	1.3–2.6	Velero III
Off Isla Santa Fe (Barrington)	88–134	810-38 AHF-	26-01-38	1			1.9	Velero III

Mandible without distinguishing characters. Maxillule with proximal endite strongly tapering; endopod with tuft of moderately long setae basally, and 1 stiff moderately long bristle on slightly produced internal lobe, external lobe slightly produced and with moderately long setae distally. Maxilla with endopod inflated basally, reflexed, exceeding scaphognathite in distal extension. First maxilliped with endopod approximately one-half length of exopod; exite produced; basal segment of exopod moderately inflated. Second maxilliped without distinguishing characters. Third maxilliped with coxa with strong acute spine encircled by moderately long plumose setae; basis with 1 or 2 short spines obscured by short stiff serrate setae; ischium with crista dentata of 6 to 8 corneous teeth; merus with moderately long spine on dorsodistal margin. Sternite of mxp_3 with shallow median depression and interspersed long and short setae.

Chelipeds subequal. Right stronger and slightly longer than left. Dactyl moderately long, approximately one-third length of palm, smooth but with tufts of moderately long setae on dorsal surface and mesial margin; lateral margin with tufts of long plumose setae; cutting edge with 2 prominent calcareous teeth proximally, separated by smaller corneous teeth; short corneous teeth distally usually with subterminal small calcareous tooth and distal small corneous claw; overlapped by fixed finger, with slender longitudinal hiatus, ventral surface with 2 rows of tufts of short stiff setae near cutting edge. Palm subrectangular, usually equalling length of carpus, slightly inflated dorsoventrally; dorsal surface somewhat convex and with irregular rows of short acute spines extending to distal

portion of fixed finger, also with tufts of moderately long setae; dorsomesial margin with row of short acute spines and moderately long plumose setae; dorsolateral margin with row of short acute spines extending to proximal portion of fixed finger, with tufts of moderately long plumose setae, more numerous on distal half; cutting edge of fixed finger with strong calcareous tooth proximally and corneous teeth interspersed with short calcareous teeth distally, terminating in small calcareous claw, encircled by tufts of short setae; mesial face slightly flattened, lateral face somewhat convex, each with row of moderately long plumose setae; ventrolateral margin with short corneous subterminal spine, near claw; ventral surface with scattered tufts of short setae. Carpus trapezoidal in cross section, usually equalling length of merus, slightly inflated ventrally, exceeding palm in depth; dorsal surface convex and with 3 irregular rows of strong acute spines, increasing in size distally; ventrolateral distal angle with moderately long acute spine, all surfaces with numerous tufts of moderately long setae. Merus triangular; dorsal margin glabrous proximally but with row of moderately long setae distally; mesial face with rows of short setae near dorsal margin and ventral surface; lateral face with rows of tufts of moderately long setae near dorsal margin and ventral surface; ventral surface with tufts of short setae; ventrodistal margin with 2 rows 1 lateral 1 mesial, each with 1 to 4 spinules ending at their correspondent ventrolateral and ventromesial angles, all spinules increasing in size distally and partially obscured by tufts of moderately long setae. Ischium with 2 to 5 spinules and moderately long setae on ventromesial margin; ventrolateral margin with 1 to 3 spinules obscured by moderately long setae; dorsal margin proximally and ventral surface each with tufts of short setae. Coxa with 2 or 3 spinules on ventrolateral margin distally and few short setae; ventromesial margin with 1 or 2 short acute spines distally, partially obscured by tufts of moderately long setae; ventrolateral and ventromesial margins proximally each with row of granules.

Left cheliped slender. Dactyl equalling or slightly exceeding length of palm smooth but with tufts of moderately long setae on dorsal surface and mesial margin; lateral margin with tufts of long plumose setae; cutting edge with row of spatulate corneous teeth, terminating in small corneous claw; overlapped by fixed finger, with slender longitudinal hiatus; ventral surface with 2 rows of tufts of short stiff setae near cutting edge. Palm ovate, slightly shorter than carpus, somewhat inflated ventrally; dorsal surface slightly convex, with median row of short acute spines on proximal half, dorsal surface and lateral margin with tufts of moderately long setae; mesial margin with tufts of long plumose setae; cutting edge of fixed finger with spinulose corneous teeth interspersed with few calcareous teeth, terminating with 1 short calcareous claw, encircled by tufts of short setae; ventrolateral margin with short corneous subterminal spine, near claw; ventral surface with scattered tufts of short setae. Carpus trapezoidal in cross section slightly shorter than merus, somewhat inflated ventrally, exceeding palm in depth; dorsal surface convex and with 2 rows of strong acute spines, increasing in size distally; ventrolateral distal angle with moderately long acute spine, all surfaces with scattered tufts of moderately long setae. Merus triangular, dorsal margin glabrous proximally but with row of moderately long setae distally; mesial face with rows of short setae, ventrodistal margin with 2 rows, 1 lateral and 1 mesial, each with 1 to 5 spinules ending at their correspondent ventrolateral and ventromesial angles, all spinules increasing in size distally and partially obscured by tufts of moderately long setae. Ischium with 5 to 8 spinules and moderately long setae on ventromesial margin; ventrolateral margin with 1 to 4 spinules obscured by moderately long setae; dorsal margin proximally and ventral surface each with tufts of short setae. Coxa with 2 spinules on ventrolateral margin distally and few short setae; ventromesial margin with 1 or 2 short acute spines distally, partially

obscured by tufts of moderately long setae; ventrolateral and ventromesial margins proximally each with row of granules.

Ambulatory legs moderately long, usually overreaching chelipeds by three-fourths length of dactyls of P_2 ; generally similar in armament and ornamentation. Dactyls relatively short, exceeding length of propodi by one-fourth to one-third their own length; in lateral view, curved ventrally; in dorsal view, strongly twisted; terminating in relatively long corneous claws; dorsal margins each with moderately long stiff setae; mesial faces with 2 rows of short stiff setae near dorsal margin of proximal half, becoming a single row on distal half, and row of moderately long stiff setae near ventral margin; row of 4 to 6 corneous spines on mesial face ventrally increasing in size distally; lateral faces each with sparse row of short setae on midline and row of moderately long stiff setae near ventral margin. Propodi moderately long, exceeding length of carpi by one-fourth to one-third their own length; dorsal surfaces each with row of moderately long plumose setae interspersed with short stiff setae; lateral faces each with row of short stiff setae near dorsal and ventral margins; ventral margin with sparse stiff spinules; mesial faces with row of short stiff setae near dorsal margin and on midline; ventromesial margins each with moderately long plumose setae increasing in size and number distally and with 1 short distal spine. Carpi moderately short approximately three-fourths length of meri; dorsal surfaces each with row of 6 to 11 spines, increasing in size distally, with row of tufts of moderately long plumose setae laterally and with row of sparse stiff setae mesially; mesial faces usually glabrous but with few short setae on distal margins; ventral surfaces with few tufts of short setae; ventromesial and ventrolateral margins each with few moderately long setae distally; lateral faces each with row of tufts of short setae on midline. Meri laterally compressed, moderately long; dorsal surfaces glabrous but with row of tufts of moderately long plumose setae laterally and with row of stiff setae mesially; mesial faces each with row of tufts of moderately short setae near ventral margin, and tuft of short setae proximally (P_2); ventromesial margin of P_2 in larger specimens with one spinule on distal half; ventrolateral margins of P_2 each with 3 to 5 spinules on distal half and moderately short setae, and with moderately strong spine at ventrolateral distal angle; ventrolateral margins of P_3 unarmed but with few moderately short setae; lateral faces each with row of moderately short setae near ventral margin. Ischia with dorsal and ventral margins each with moderately long setae. Coxae each with row of tufts of moderately long setae on ventromesial and ventrodistal margins. Anterior lobe of sternite of P_3 subrectangular, anterior margin with a shallow median depression, and 2 to 4 spines at each side laterally, partially obscured by long setae.

Fourth pereopods simple. Dactyls each with 3–7 corneous scales increasing in size distally; larger specimens occasionally with additional row of 3 or 4 corneous scales; ventromesial margin, at base of claw with type II preungual process. Propodal rasp with single row of 9–14 corneous scales, occasionally with proximal double row of 2–4 acuminate corneous scales.

Fifth pereopods chelate.

Males with left sexual tube well developed, coiled; right sexual tube usually absent, occasionally slightly produced and obscured by moderately long coxal setae; 3 biramous unpaired pleopods, with external rami moderately well developed, internal rami reduced.

Female pleopods unknown.

Telson and uropods without distinguishing characters.

Color.—Living specimens have not been observed; in ethanol-preserved animals all colors fade out to straw color; iridescent aspect is maintained.

Distribution.—Mexico: Gulf of California and outer coast of Baja California; Ecuador: Galápagos Islands.

The depth range for this new species is 18–274 m.

Remarks.—*I. haigae* n. sp. is the analogous Pacific species of *I. globulus*, sharing the strongly dilated corneal region, and the subrectangular anterior lobe of sternite of P_3 . The new species can be separated from its analogous species by the more spinose chelipeds, the longer spine on the dorsodistal margin of MXP_3 , and the different type of preungual process of P_4 .

The new species is named for Janet Haig, in recognition of her contributions to hermit crab systematics and for providing the specimens for its description.

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